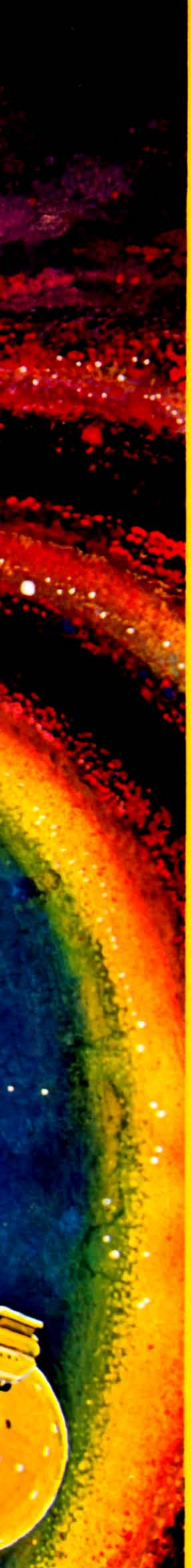
DANGEROUS FRONTIERS

The fight for survival on distant worlds

Steven Caldwell

GALACTIC ENCOUNTERS



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The ships of the Galactic Federation's Survey and Preliminary Study Service ceaselessly range among the alien stars and unexplored planets which lie beyond the distant Perimeter. Contact with the bustling, central worlds of the Federation is difficult and infrequent as they face the dangers of the vast unknown.

But the prosperity and growth of this great association of worlds would be impossible without new sources of supply and new avenues for expansion. Scarcely more than one in every hundred planets explored proves to be of sufficient interest to justify the implementation of a settlement programme.

All the planets described in *Dangerous Frontiers* have won a place in the Federation at great cost in lives and effort, and their existence owes much to the courage and determination of the creatures who first struggled for a foothold in their lonely and alien landscapes.

Dangerous Frontiers is a study of those worlds as they are today. Some are vital to the network of trade, others have faded in importance and a few are only just emerging from obscurity. Whatever their present status in the Federation, it is to those who struggled alone in the emptiness beyond the frontiers that the honour belongs.

Steven Caldwell joined the Galactic Federation Security Force in 2393, and quickly rose to the rank of Group 1 Battleforce Commander. During his 15 years of active service he travelled to all parts of the Federation, and was awarded the Andromeda Star for his part in the settlement of the Perimeter Worlds.

He now runs his own company prospecting for the ore *zyrillium* – the major propulsive fuel for Interstellar Military Interceptors.

£2.50

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Intercontinental ibp Book Productions

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Introduction

Many of the inhabitants of the Galactic Federation believe that throughout the many systems within the Federal boundaries, thousands of planets teem with bustling colonial settlements, whose members are busily carving a prosperous niche for themselves far from the well-regulated lives of those living on the central planets.

It is certainly a fact that hundreds of new worlds are discovered every Terran year, but the proportion of these which are useful is extremely small, and those where life is possible without the creation of artificial environments is even smaller. Every planet requires a long and careful period of study before any permanent base is established. It is all too easy for a base to be wiped out by some unknown infection or virus. Even the most apparently pleasant and temperate world can present dangers and difficulties and the process of establishing a secure settlement takes a great deal of time and effort.

The various forms of planetary classification are often confusing to the layman, but in fact they fall into a few main categories:

A *Sovereign World* is one which enjoys autonomy as a full member of the Galactic Federation and is represented on the General Council. Sometimes independent settlements do exist on such worlds, but they are licenced by the local government for specific reasons.

Colonial Worlds are becoming increasingly rare, but are those registered as possessions of Sovereign Worlds and are wholly owned by them.

Settler Worlds, however, are to be found throughout the Federation, and come under the jurisdiction of the General Council itself. They are planets where settlements exist which are, for various reasons, not yet in a position to apply for Sovereign World status. The most usual reason is that the planet was originally occupied to exploit specific and limited resources but is in every other respect, completely dependent on outside aid and supplies. Frequently, the conditions and environment do not encourage diversification and thus prevent the development of a cohesive and balanced social structure.

Some Settler Worlds do succeed in making the transition to sovereignty. One such is Esthymon, the trade and entertainment center of the Beta Phoenicis system, for which membership is pending.

Although in principle, any individual is free to apply for residency on any world in this category, there are in fact some exceptions such as those where military jurisdiction is enforced or those occupied by official Federation scientific teams carrying out investigative surveys. Not all of the settled planets are included here, but this selection is representative of most types.

Each inhabited planet is allocated a classification according to the general nature of its environment, and in addition to the main description, is given a numerical reference to indicate its position within the general category.

Class A Temperate Earth-type environment. Our own planet is Class A2.

Class B Moist, Tropical habitat with high humidity rating.

Class C High surface temperatures within the limits of human tolerance, with limited water presence.

Class D Arid worlds with low temperature ranges. This sometimes indicates planets where the available moisture is locked in extensive ice fields.

Class E Moist, low temperature worlds, usually indicating cold planets with extensive oceans or seas.

Classes F and G Special categories. See navigation manuals at time of issue.

Monk's Field

TYPE OF SUN: Alpha Mensae Class G6 dwarf. Apparent magnitude 5.14.

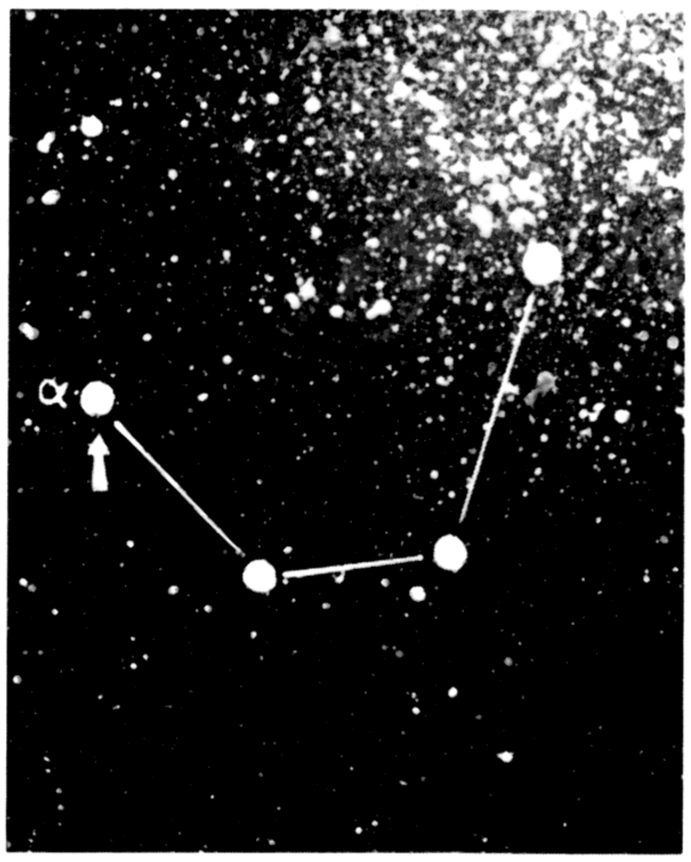
POSITION: Southern hemisphere – Mensa. Beacon code SMEN 2009.

DISTANCE FROM EARTH: 28 light years.

TYPE OF PLANET: *Class A6. Escape velocity 7.9 M.P.S. Main exports: Grade A processed ore, manufactured goods. Registered as Terran Colony but due for reclassification. Access unrestricted.*

The large, temperate planet of Monk's Field was one of the first to be settled in the rush for the stars that took place during the late twenty-first and early twenty-second centuries, when the inhabitants of Earth, revelling in their new-found freedom in space, were swept by the fever of exploration. Dozens of huge colonizer ships were constructed and launched into the unknown with their cargoes of starry-eyed humans searching for a virgin paradise in the galactic darkness. Many of these enthusiastic, but ill-prepared bands perished in the cruel wastes, but some, by good fortune and courage, managed to survive and eventually prosper.

The expedition to Alpha Mensae knew that of the three planets detected in this system, only one demonstrated favourable properties, and led by Dr. Edwae Monk, they finally made planet-fall in 2107 AD. They found themselves on a rich and fertile world devoid of competitive life-forms, and were able to establish themselves within a remarkably short period of time. Most of the plant life that had been carried with them from Earth adapted quite readily to the rich soil of Monk's Field, and the community rapidly became self-supporting and were soon considering exporting their surplus produce to the over-populated planet they had left behind.



Alpha Mensae.

But three years later, disaster struck in the form of deadly strains of virus that appeared very suddenly and attacked both the settlers and their food crops – with drastic results. Within the space of two Earth months the population had been reduced by nearly two thirds and the survivors were dependent on stored food supplies. A desperate call for help was sent.

Monk's Field was, and still is, the nearest colony to Earth at 28 light years distance, and the Terran Authorities were able to dispatch medical and research teams without delay. They managed to isolate the various strains of virus and discovered that they all shared a four year cycle of development, which explained the absence of any significant indigenous species. Although the research teams cooperated with the settlers to try to evolve new strains of cereal crops which would be resistant to the powerful native organisms, they had very limited success. They did, however, succeed in producing vaccines to protect the colonists themselves, who decided to remain on the planet and combat the problem as best they could.

Ironically, the virus cycle was directly responsible for ensuring an important and prosperous future for the settlers of Monk's Field. They concentrated their efforts on producing enough food during the three years that the malignant organisms were dormant to carry them over the active period which lasted for most of the fourth year.

One of the first sights to meet the eyes of a visitor to Monk's Field, are the impressive orbital terminals built in the mid twenty-second century.
Overleaf
A continuous stream of commercial ships from all over the Federation can be seen in the vicinity of Monk's Field, and are a clear indication of its importance as a trade center.

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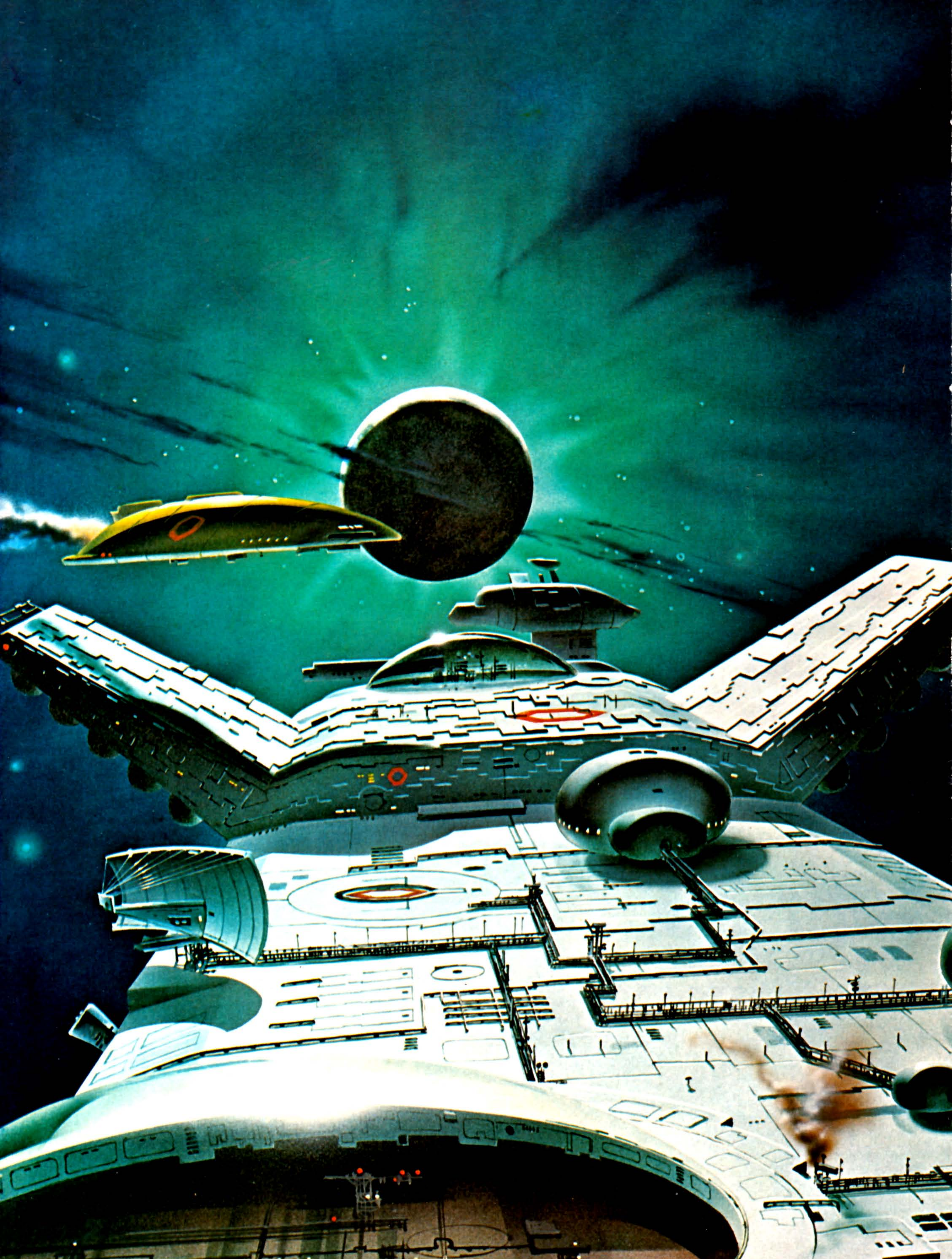
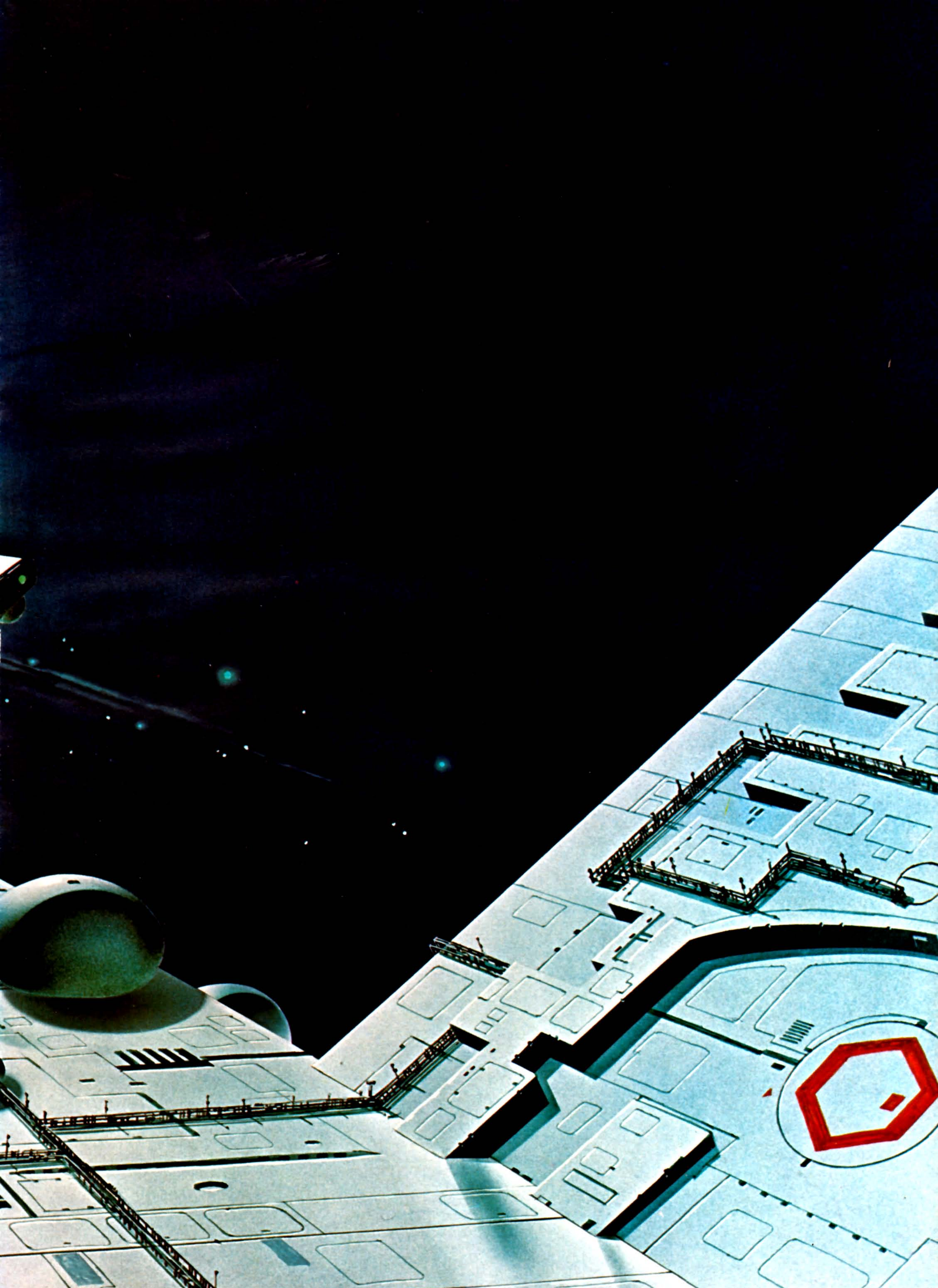




This gave them about ten Earth months with little to do but eat, sleep and explore their new home, and it was a valuable opportunity to rest from the rigours of the fight for survival and to learn more about the nature of the planet.

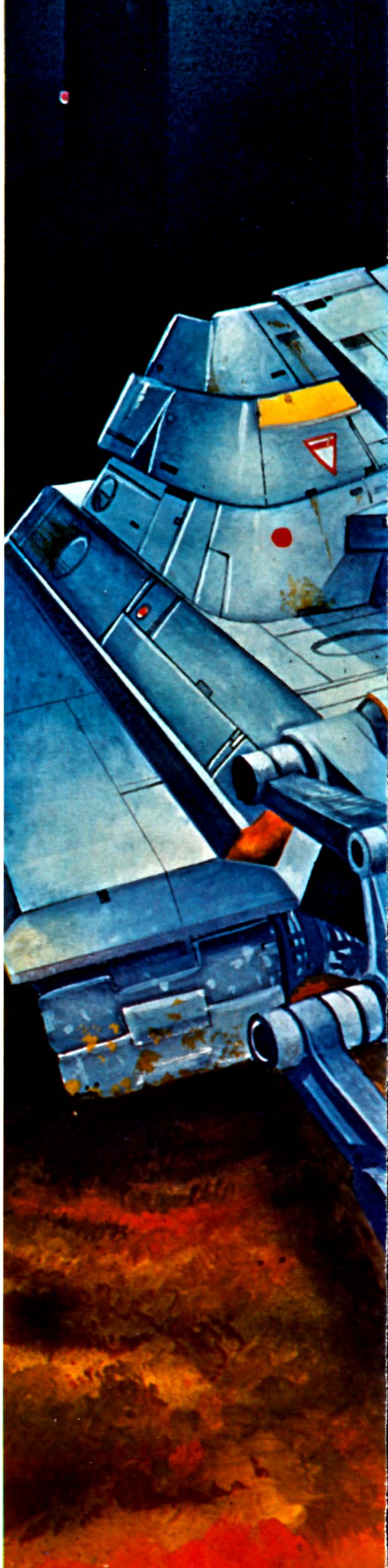
It soon became clear that at some time in the planet's history, it had been almost entirely covered by a great sea which had laid down successive layers of mineral rich deposits. The core of the planet had stabilized well before this time and very little crust movement had taken place. There were few mountains worthy of the name, and beneath the vast alluvial plains lay enormous strata of valuable minerals, comparatively undisturbed by crust movement and therefore extremely easily and economically extracted.

Using the few items of mining equipment which had been included in the stores of the original colonizer vessel, the settlers were able to open sufficient test mines to confirm the exploratory survey, and using this basic gear, extracted enough ore in the first year of operation to charter a small freighter. The ore was shipped to the huge processing plants at Proxima Centauri in exchange for more sophisticated and efficient equipment, which allowed them to significantly expand the scope of the operation.

Before long, the success of the mining projects came to the attention of the authorities, and after some consideration, the new Federal Administration agreed to supply assistance in finance and equipment which allowed full-scale exploitation to take place. Within a remarkably short period of time, major extraction sites sprang up all over the surface of Monk's Field, closely followed by the establishment of a number of processing plants, thus avoiding the cost of shipping huge quantities of ore to Proxima. Gradually, the nature of the community changed from its original agrarian character, and although large tracts of land are still used for food production, much of the supplies, particularly during the fourth year of the viral cycle, are now imported.

The growing prosperity of Monk's Field attracted a steady stream of immigrants, and in addition to its increasing importance as a supplier of raw materials, it also became a base for manufacturing enterprises of every description. By the late twenty-second century its close proximity to the core of member worlds and its enormous resources, had made it the most important industrial center within the Galactic Federation. It was rivalled only by the gigantic orbital complexes around Jupiter in the Sol System which had the advantage of being able to draw on inexpensive and unlimited radiation energy, but it has since been overtaken in size and importance

Monk's Field is the site of one of the Federation's largest recycling yards. The S.H.M.40 Mauler is typical of the equipment used there.
Overleaf
Even the cold Polar regions of the planet are exploited for the oil and mineral deposits that lie beneath the frozen ground. A VTOL Hopper lands at one of the drilling bases.



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The largest commercial Transit Terminal in the Federation is to be found at Grafton Spread, near the equator. It was completed in 2186 AD when it became apparent that the orbital terminals would not be able to handle the massive increase in traffic.

by the much younger Beta Phoenicis center.

Although Monk's Field is not classified as a Sovereign World and does not have a separate voice in the Federation Council, it is not, strictly speaking, a Settler World either as Earth has insisted on its retaining its early colonial status. It is likely that this position will gradually change; its importance to the Federation as a whole is well-known and considerable resentment has grown among member worlds who relinquished *their* direct control of other colonies in accordance with the Constitution of the Galactic Federation. Nevertheless, strong ties with Earth are apparent in the many traditions and customs imported by the original settlers, and also from the fact that many of the smaller communities, particularly those engaged in agricultural industry, still use English as their native tongue.

Monk's Field is within easy reach of most travellers. Entry to the planet is unrestricted and no special papers are required. Numerous entertainment facilities are available, but apart from the many impressive industrial sites, and an excellent Museum of Technology, there is little to attract the casual tourist to the closest of the Settler Worlds.

Alpha Indi II

TYPE OF SUN: Alpha Indi Class G4. Magnitude 0.7.

POSITION: Southern hemisphere – Indus. Beacon code SIND 4103.

DISTANCE FROM EARTH: 102 light years.

TYPE OF PLANET: *Class D5. Escape velocity 8.1 M.P.S. Main exports: High grade precious metals, tourist trade. Landing restrictions in certain areas due to military bases.*

One of the scores of gigantic ore extraction plants constructed on Alpha Indi II to process the sea water. This plant is still operational.

The second and outermost planet of the Alpha Indi system once marked the furthest point out from the Federal center that had been reached by the early colonizer ships during the first part of the twenty-second century. The *De Gama* was one of the last giant vessels to leave the Sol system as the initial wild dash to settle the stars drew to a timely close. Too many expeditions had vanished without trace in the darkness of deep space, and too many others succeeded in making planet-fall only to perish in alien environments for which they were unprepared. The Federation authorities were already beginning to impose rigid controls on colonial expansion when the *De Gama* left from the great Martian terminus with her cargo of 2000 settlers and their equipment.

Nearly 102 light years out from her berth on Mars and now carrying 2037 settlers, she emerged from hyperspace into the glare of another yellow sun, and edged towards the nearest of the two planets that circled Alpha Indi. Once the huge ship had settled onto the surface without mishap, and the Terran passengers had stepped cautiously onto the soil of their new home, Man had reached the furthest point from his Homeworld that he would occupy for many years to come. It was an unwelcoming place of stark, rocky landscapes and vast gritty plains separated by grey and lifeless seas.

After the initial euphoria of a safe arrival had worn off, many of the colonists must have wondered what had driven them to travel so far across the unknown to this bleak and lonely world. Almost the only form of animal life to be seen were small, rat-like creatures whose exoskeleton gave them a striking resemblance to the Terran Armadillo as they wandered across the windswept plains. It was later discovered that the greatest variety of life was to be found in the broad oceans that encircled the planet. The extremely high mineral content of the waters had led to considerable specialization among the creatures living there, but there were no indications that any of them represented intelligence. A large number of different species seemed, in fact, to be little more than drifting lumps of mineral ore, maintaining buoyancy by forming air pockets in the metallic bodies they had created for themselves from the material extracted from the sea. The climate, although tolerable, proved to be persistently cool with minimal seasonable variation and permanently overcast skies.

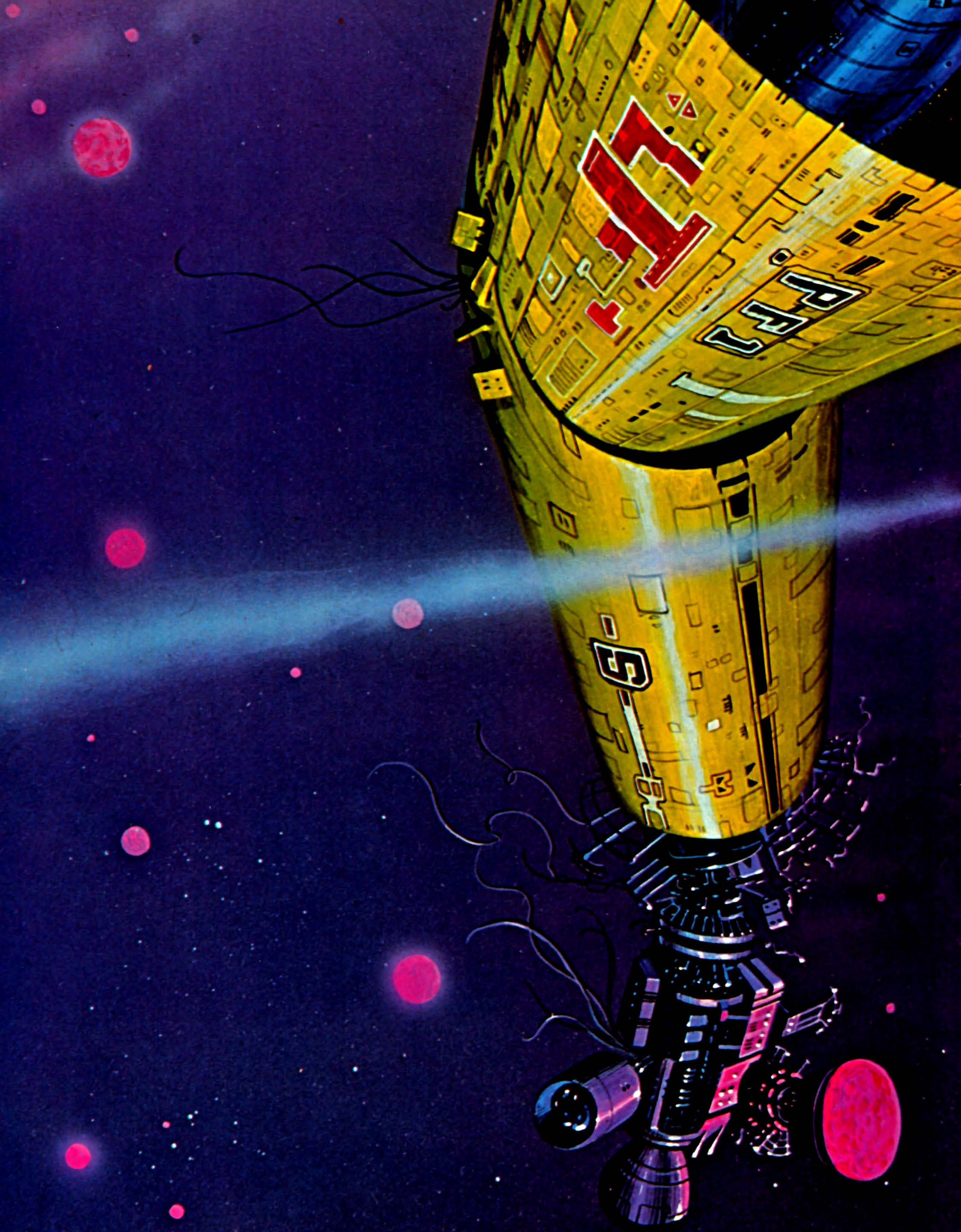
From the start, the settlers found themselves hard-put to wrest a living from this inhospitable world, and it was many years before they had established a secure foothold and could consider their position in relation to the worlds they had left behind. During this time, the web of interstellar trade was expanding rapidly and was gradually moving outwards once more. There was a steadily increasing demand for raw materials to feed the shipyards and factories of the prosperous inner worlds, and it was to this need that the settlers of Alpha Indi II looked.

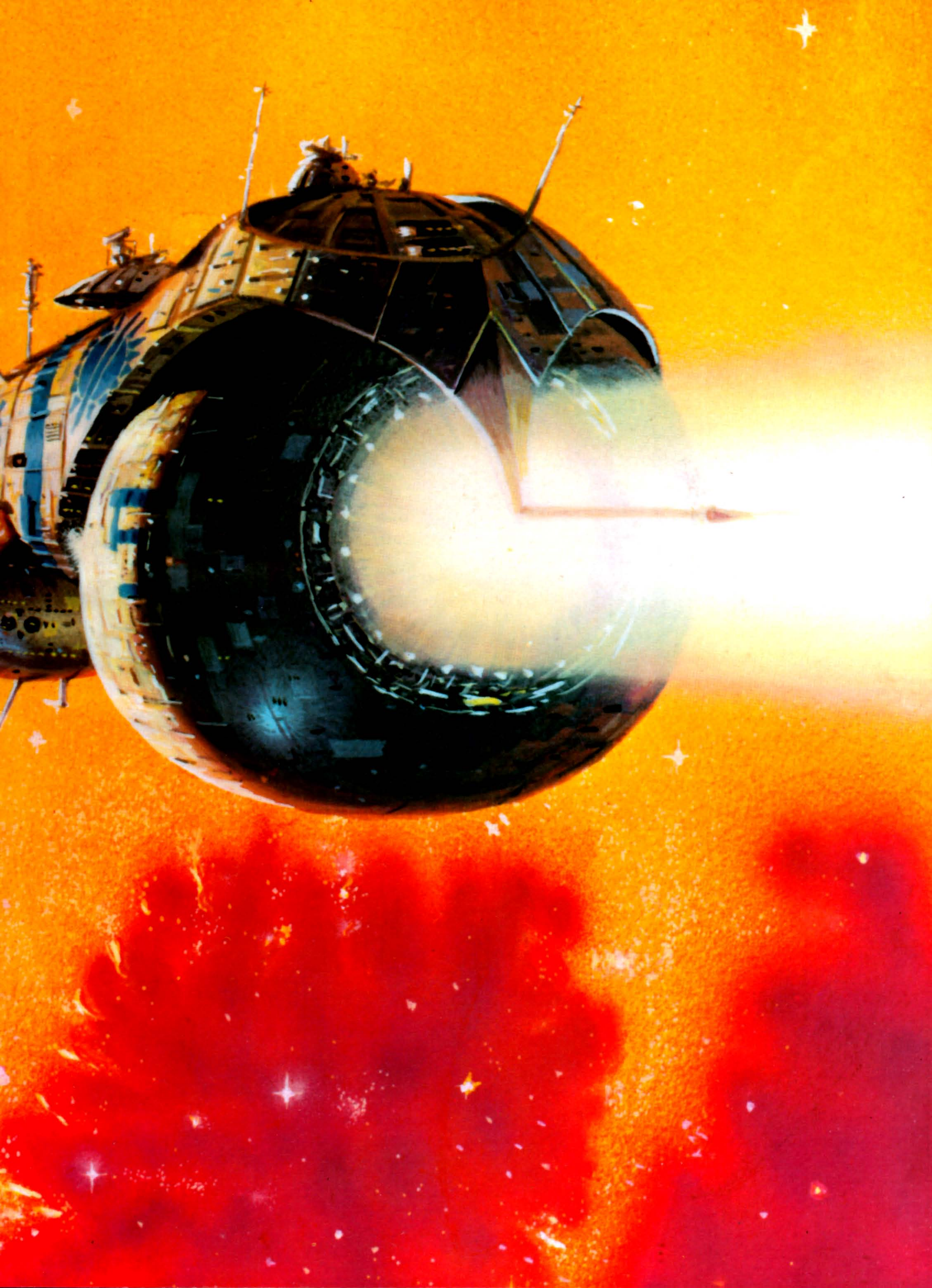
There was little doubt that the planet possessed considerable reserves of mineral wealth of many kinds, but the difficulty lay in finding and extracting them. The extremely high concentrations of material in the oceans suggested that vast deposits had been exposed and eroded by the sluggish waves, but the colonists were unable to discover any significant concentrations. The vast reserves of valuable materials were

evenly, but very thinly distributed throughout the planetary crust. There was no doubt that processing the sea water would prove the most efficient method of extraction. The commercial values of many minerals were reaching peak levels and grants from the Federation enabled the colonists to equip and operate a number of massive sea-based extraction plants. Despite the heavier operating costs and lower production rates involved in this method, the high quality of the ore and the strong market demand brought considerable prosperity to Alpha Indi II.

The hardy colonists who had struggled for so long to survive in the harsh environment of this isolated world, experienced a dramatic change in their fortunes as the volume of exports steadily rose. Although the Federation does not encourage large-scale investment in newly-settled worlds by individual interests, it alone could not hope to provide the support

At one time the planet was considered a prime investment area, but the rapid decline in the interstellar market for raw materials left dozens of large scale projects uncompleted. This enormous construction orbiting Alpha Indi II was to be the main section of a purpose-built loading terminal, but was never completed.
Overleaf
The once bustling space-lanes leading to Alpha Indi II are now seldom used. Only vessels en route to the large military yards now based there provide a tangible link with the rest of the Federation.





needed by Alpha Indi II in order to take full advantage of interstellar demand. Many of the member worlds were prepared to undertake the funding and equipping of large-scale operations to ensure a supply of the much-needed materials, and Alpha Indi II became the focus of considerable attention.

The spacelanes to the planet soon filled with freighters and cargo vessels shipping ore out and equipment in, as well as a growing number of

Abandoned storage module.

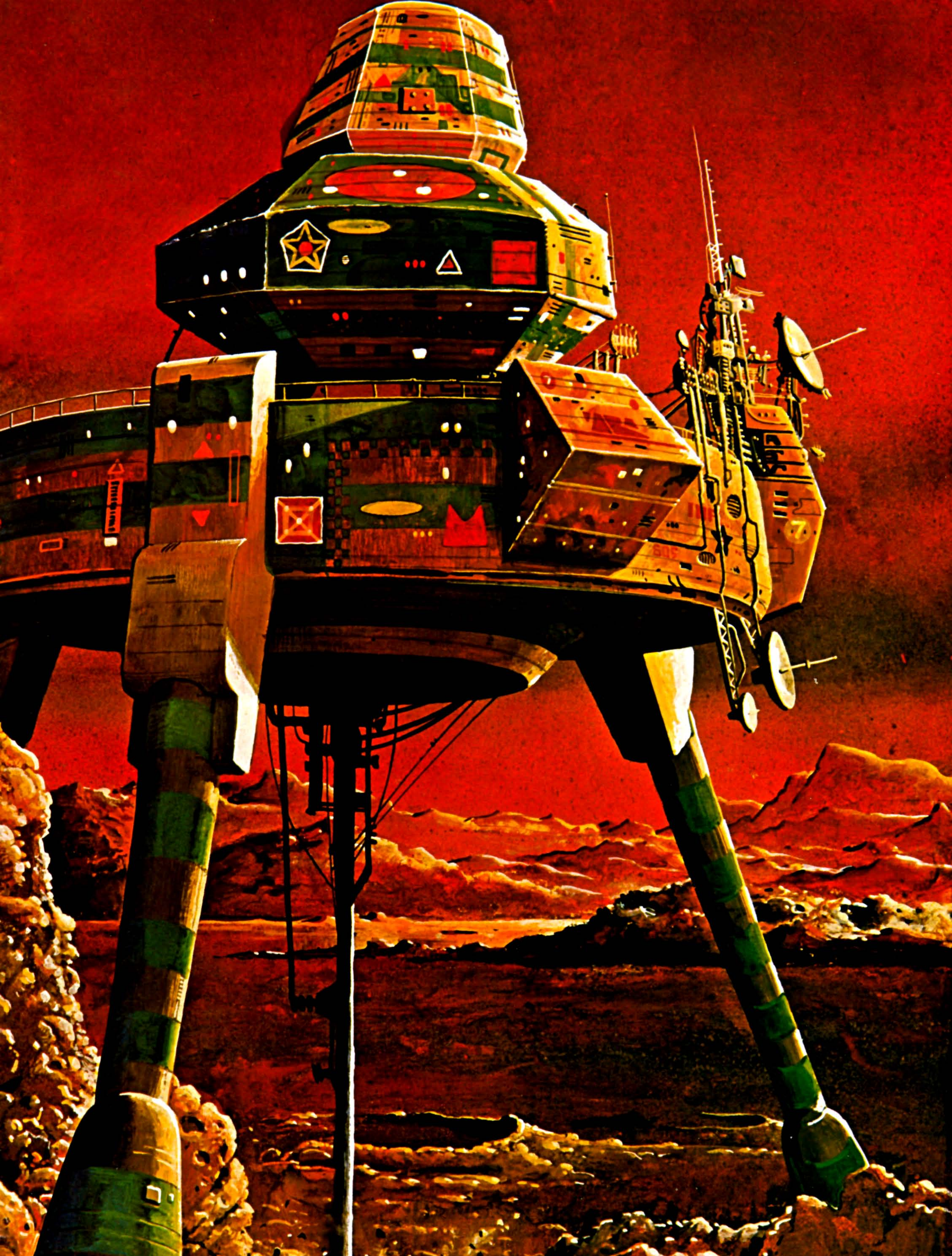
passenger ships full of technicians, engineers and others seeking a share of the prosperity.

Unfortunately, this situation was not to last. New worlds were being opened up all around the expanding Galactic Perimeter, and the soaring costs of raw materials added new impetus to the search for synthetic substitutes. Although other planets employing more conventional methods of production were able to accept the decline in market prices, Alpha Indi II found that operating costs were beginning to out-strip revenue, and suddenly, almost overnight, the traffic flow dwindled dramatically and the planet once more became a backwater in the Federation. Subsidies from the Colonial Bureau continued for some time as the settlers awaited a major improvement in market conditions, but it was eventually clear that the boom days would not return.

Groups of settlers began to leave to seek their fortunes elsewhere, and when the Federal grants ceased, the huge floating plants began to close down one by one, and Alpha Indi II slowly became a ghostworld. The Federation's many attempts to encourage the growth and development of other industries met with little success, and only the construction of a major military base and repair-yard prevented a complete exodus from the planet. Some mining work still continues, but only one of the giant sea-based complexes is fully operational and this functions solely to supply the military yards with materials. The only remaining exports are small quantities of the rarer minerals which can be recovered by this process.

Despite the barrenness and the rather gloomy aspect of this world, it is enjoying a slight renaissance as a fashionable retreat for wealthy citizens seeking a brief and unusual spell in its desolate landscapes.

Huge reserves of oil lie beneath the surface, and despite its obsolescence as an energy source, the military yards make use of its abundance as a cheap alternative fuel, at the same time providing employment for some of the few civilians still inhabiting this lonely planet.



New Mars

TYPE OF SUN: Delta Bootis Class G4 yellow giant. Magnitude 0.8.

POSITION: Northern hemisphere – Bootis. Beacon code NBOO 1985.

DISTANCE FROM EARTH: 116 light years.

TYPE OF PLANET: *Class C2. Escape velocity 6.9 M.P.S. Main exports: Sole exporter of Elixin, tourism. Landing restricted to authorized sites only.*

The first colonizer ship bound for Delta Bootis and the planet of New Mars emerged from hyperspace in 2163 AD.

The process of colonization follows a fairly uniform pattern during its early stages. The discovery of a suitable planet is logged by the authorities and survey teams are commissioned to carry out preliminary studies in order to establish whether the world is suitable for settlement and what resources, if any, may be exploited. Should it then be approved for occupation, those choosing to settle there are faced with the task of carving a place for themselves out of its alien landscapes, and the nature of the environment will determine how long the period of establishment and consolidation will be.

Once the settlement is securely based, the colonists can turn their attention to exploiting any assets the planet has to offer, and it is at this point that the pattern of development can follow one of two main courses. An attractive and hospitable environment or an abundance of natural resources will ensure some degree of prosperity which will in turn attract other settlers from within the Federation.

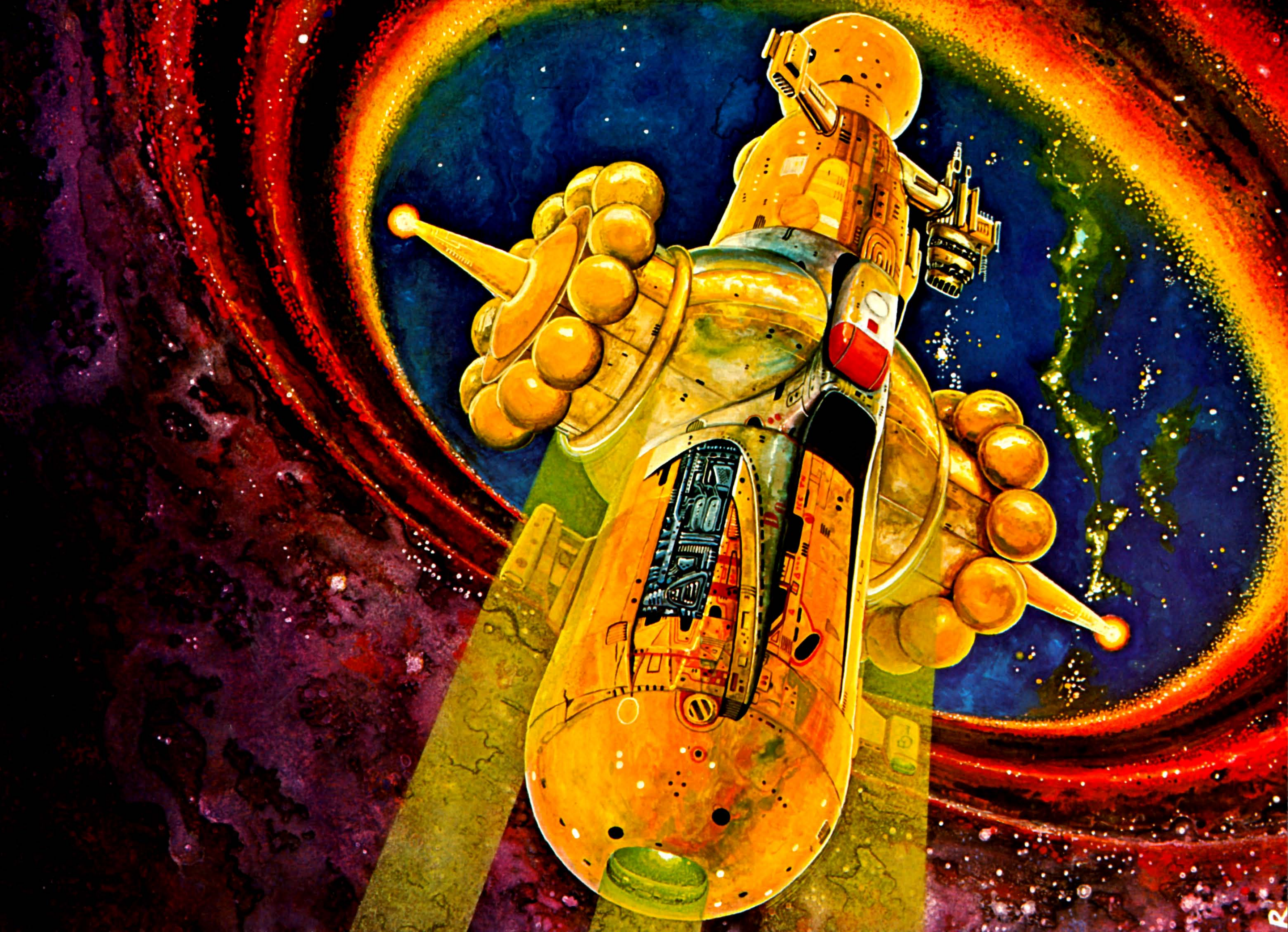
As the population increases, so the volume of domestic and export trade is likely to grow, and trade links between the new world and the Federation's members are strengthened. Trade facilities are improved and expanded to cater for the increase in traffic and population and, before long, the planet and its inhabitants begin to acquire some significance in the affairs of the Galactic Federation. It is then only a matter of time before the planet is represented in the General Council and can be considered for membership as a sovereign world and no longer simply a settler planet.

The alternative path is less spectacular and is represented by those planets which never lose their settlement status. The usual reasons for this are an uncomfortable or even hostile environment which restricts the population levels, or limited natural resources which do not encourage an adequate rate of commercial growth. This is frequently the case even where the world in question is able to offer a commodity for which there is considerable demand.

The planet of New Mars, in the Delta Bootis system, is a perfect example of the latter case. This tiny world, almost a miniature replica of its namesake in the Sol system, was first settled in the mid twenty-second century, a few years after the founding of the less successful colony on Alpha Indi II. Whereas the other seven bodies in this system are no more than minute fragments of airless rock, New Mars possesses a thin but adequate atmosphere and a small amount of surface water. The mineral wealth which had first attracted the interest of the settlers proved a disappointment, but was enough to just support the struggling colony.

Although almost the entire surface consists of the dry, red deserts to which it owes its name, a thick layer of subterranean permafrost enabled the settlers to meet their own energy requirements. Using somewhat primitive nuclear methods they constructed powerful heat-exchanger units which could release considerable amounts of power from the icy layer, generating large volumes of water as a valuable by-product. The first clue to the existence of this natural resource was provided by one of the native life-forms which was present over much of the planet, and which has subsequently provided the inhabitants with an important source of additional revenue.

The Dragonflowers of New Mars are one of the most popular tourist sights to be found in known space, and many thousands of off-world visitors make the journey to this little planet to see them.



Despite their awesome and rather terrifying size and appearance as they tower over the desert landscape, their huge mouths gaping in the thin air, they are in fact quite harmless, and draw their sustenance from the soil and the permafrost layer beneath them. Although they are plants, they have a complex and sophisticated nervous system in which the cavernous "mouths" play an important part. These orifices seem to serve a number of functions: as part of the respiratory system by drawing in large amounts of the thin air; as part of the productive process in that they house the receptor organs and collect the wind-carried spores, and as the organ by which one of their most endearing properties is demonstrated.

At intervals they emit soft and rather plaintive fluting sounds similar to those produced by blowing across the open neck of a flask. It is not clear what function these noises perform, but consistencies in sound patterns between the plants suggest a form of simple communication. Whatever its purpose, the "music" of the Dragonflowers has enchanted many thousands of sightseers.

Apart from the contribution

In addition to producing the Elixin for which the planet is famous, the Dragonflowers attract a huge number of tourists from all over the Federation.
Overleaf
The wealthy farmers of New Mars employ these large mobile laboratories to travel the huge distances involved in tending their unique and valuable charges.

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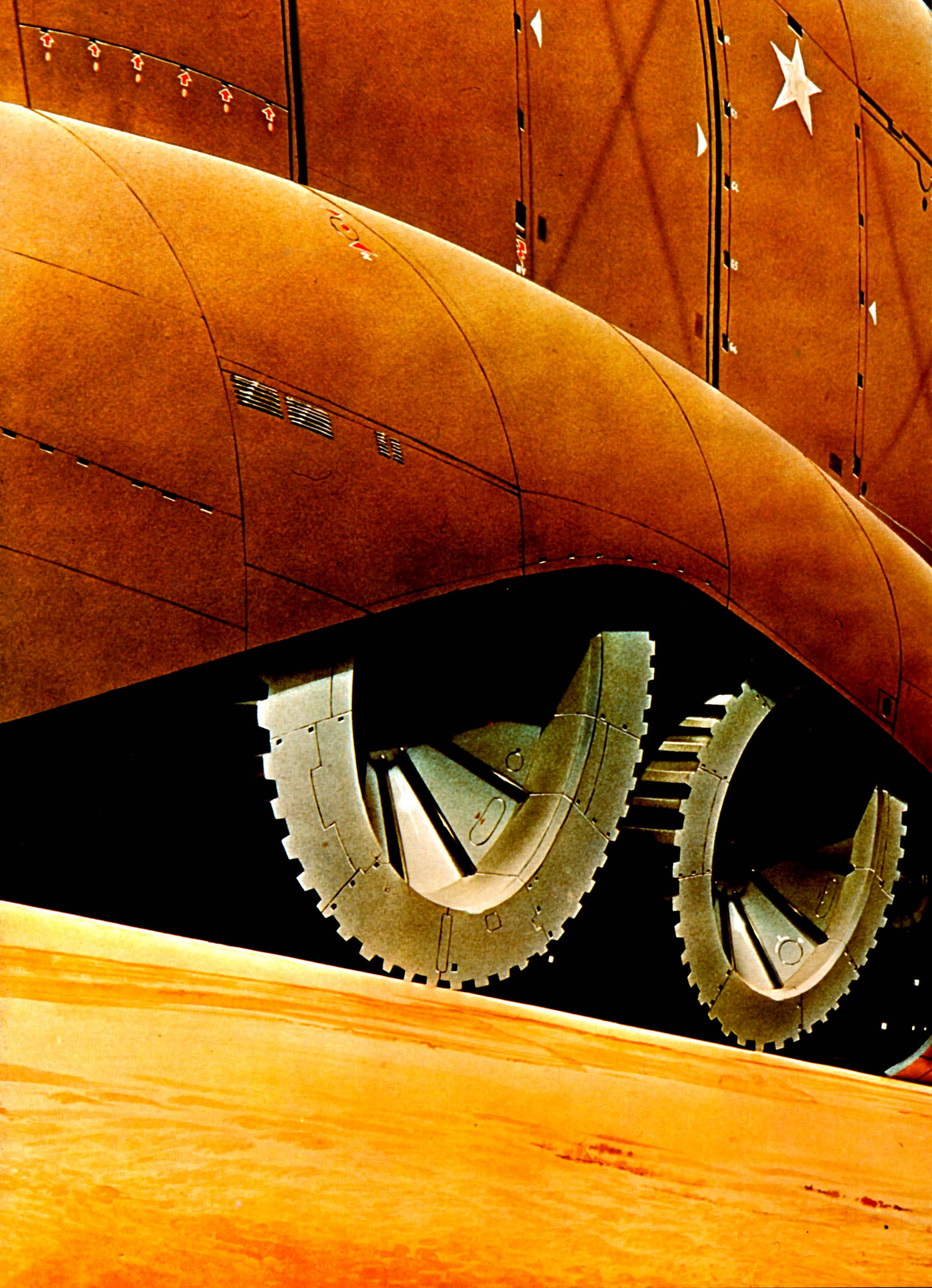
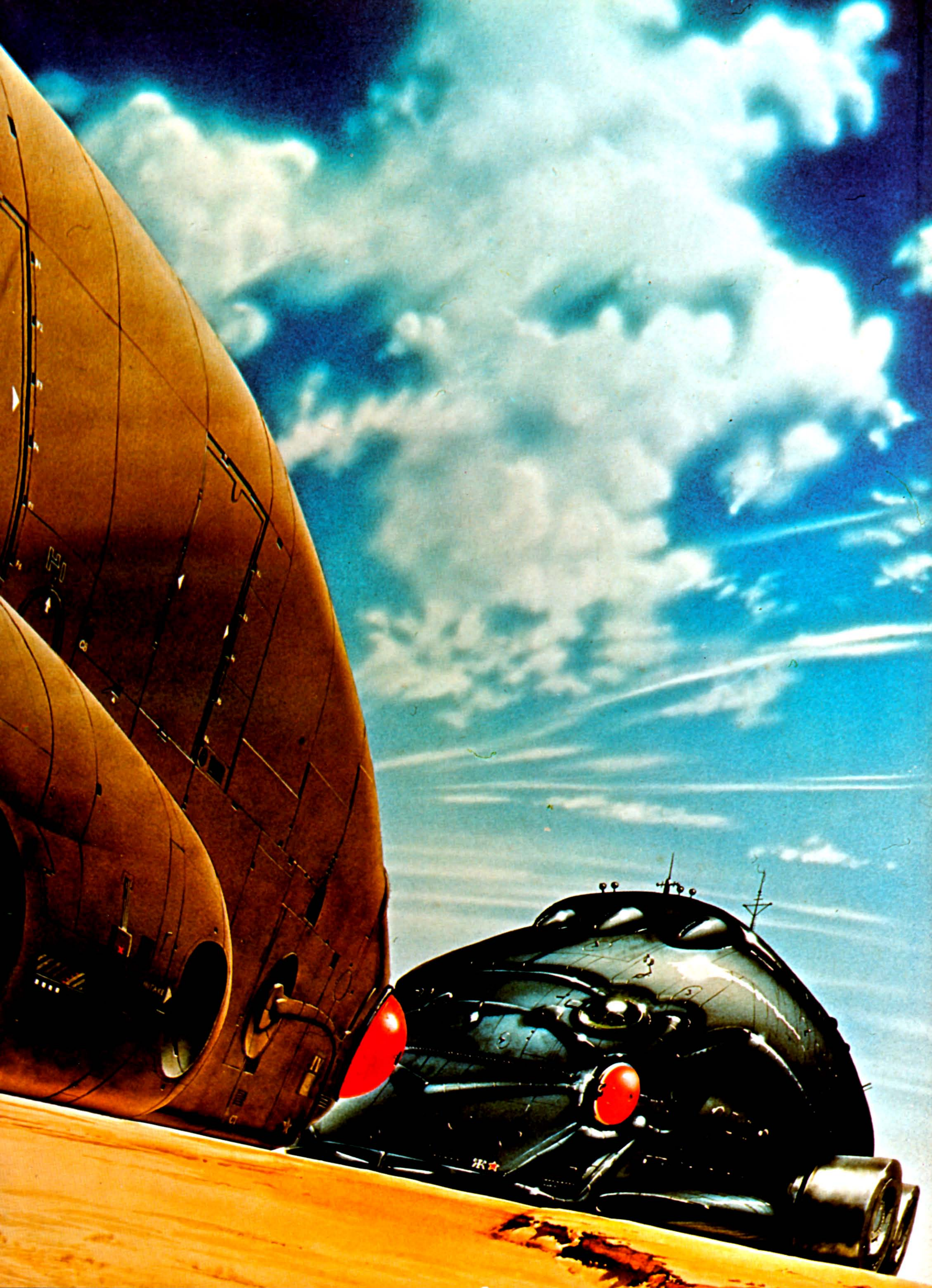
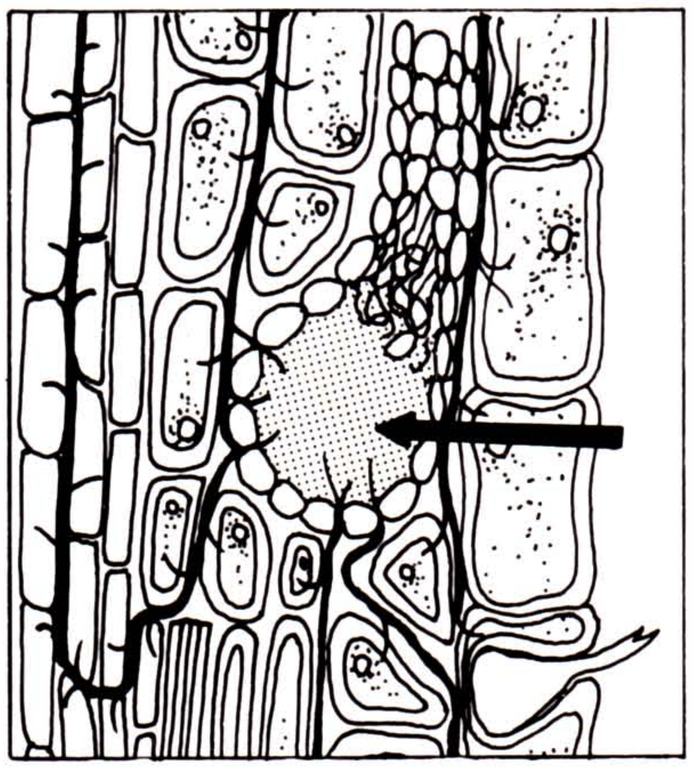




these unique plants make to New Mars's fortunes through the tourist industry, their most important value lies in their internal chemistry. Most of the plants are actually many thousands of years old, with



Dragonflower Elixin gland.

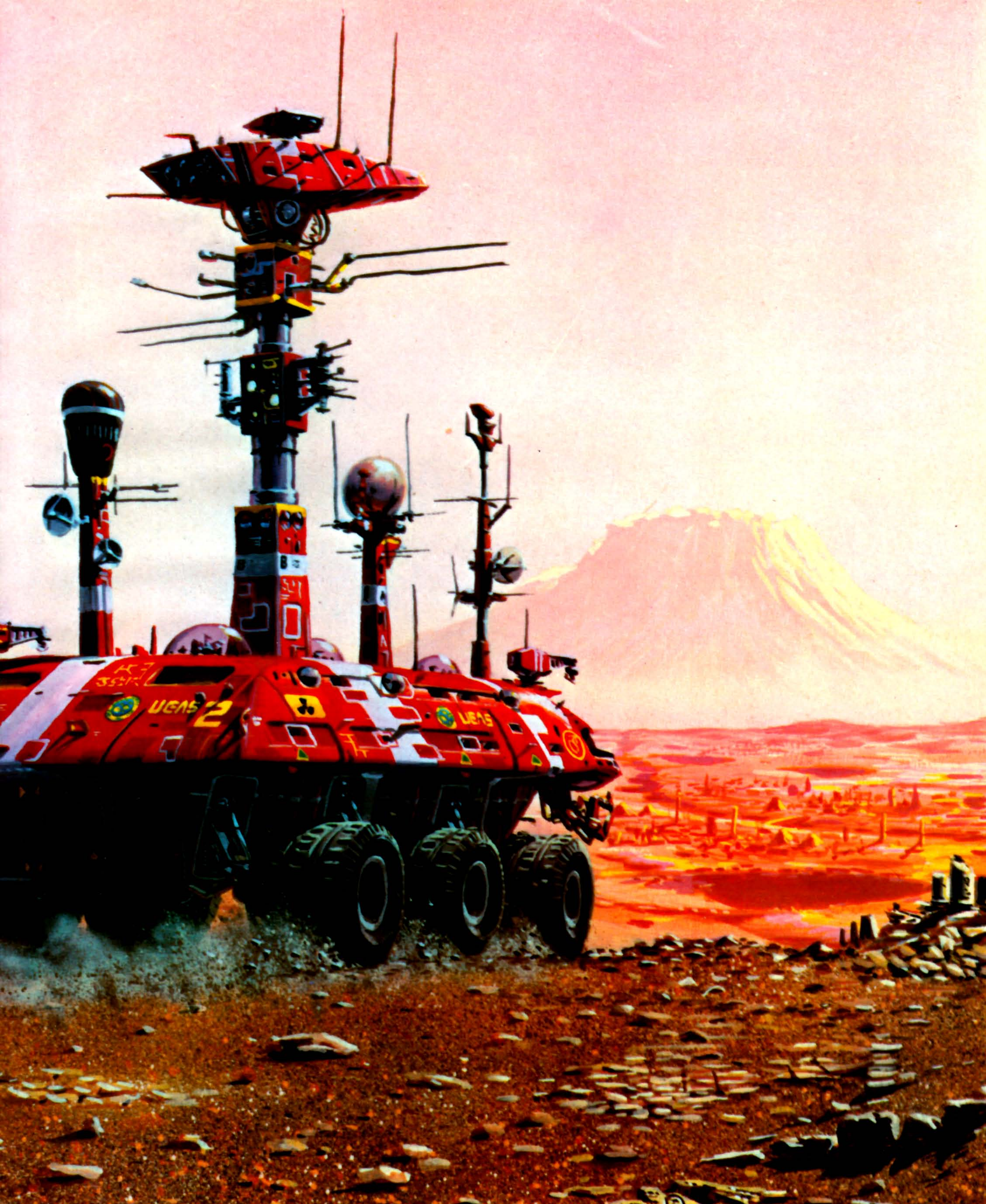
some examples having existed for up to 17,000 years. Cellular replacement is very slow and the whole ageing process is thus significantly retarded, each cell remaining active for an extremely long period before degenerating and being replaced. Prolonged study of these curious plants succeeded in isolating a compound, Elixin, manufactured by specialized internal organs, which has proved of enormous benefit to many of the worlds in the Federation.

Among its most valuable properties is the ability to retard abnormal cellular growth in many species, sometimes actually reversing the process. It also assists the body to isolate both external and internal radiation damage and acts as an extremely effective general antitoxin. Attempts to produce a synthetic substitute, although unsuccessful so far, have inadvertently resulted in a number of medical products with other important properties, such as the drug Insulactin which is used to reduce heat loss in beings working in abnormally cold environments.

The Dragonflower farmers of New Mars remain a small but prosperous community, exporting Elixin to every corner of the Federation, as only a limited amount can be drawn from each plant at any time without irretrievably damaging its well-being. Each individual farmer has to be licenced by the Federal Trade Authority in order to protect the plants, as no means has yet been found of artificially cultivating them, and the penalties damaging or interfering with the Dragonflowers are severe.

Among the other lifeforms existing on New Mars is the Chimprill, a curious primate with the ability to make fairly sophisticated hand tools. They rely almost entirely on a species of land crab for their food supply, using stone weapons to kill and dismember them, but have failed to respond to all the attempts to stimulate their intellectual development.

In order to protect their priceless and irreplaceable Dragonflower crops, the farmers regularly patrol the deserts of New Mars with sophisticated detection equipment in order to prevent intruders.
Overleaf
Despite their toolmaking skills, the Chimprills, which wander in small family groups over large areas of the planet, have failed to respond to any of the attempts to develop their natural intelligence.


UGAS 2
UGAS

Nihalan

TYPE OF SUN: Beta Leporis Class G2 yellow giant. Magnitude 1.3.

POSITION: Southern hemisphere – Lepus. Beacon code SLEP 528.

DISTANCE FROM EARTH: 180 light years.

TYPE OF PLANET: *Class C1/Low Maturity. Escape velocity 7.4 M.P.S. Main exports: Principal zyrillium exporter. Military jurisdiction, landing by special authority only.*

From the 2170s to about the turn of the century very little exploration beyond the existing Federation Perimeter took place. The homeworlds were enjoying a period of considerable economic prosperity and there was a marked lack of interest in financing expensive and highly speculative expeditions into the unknown. The rapid and extensive exploration of earlier years had meant that many new planets were not being exploited as effectively as they might be, and consolidation became the watchword of the day. Even the research institutions turned their attention to processing the enormous amount of data that had been collected over the years, and the Federation's boundaries gradually stabilized.

By the beginning of the twenty-third century, however, certain sections of the interstellar community were becoming restless and were turning their eyes towards the mysterious darkness outside the frontiers of known space. As is so often the case, the thriving trade and industry of the member planets was tending to divide the populations of the active worlds as the generated wealth began to fall into particular social areas. Those who felt that they were not benefiting as much as they should from the commercial boom started to consider ways to seek their fortunes and a renewed interest in colonization led to the start of another era of galactic expansion.

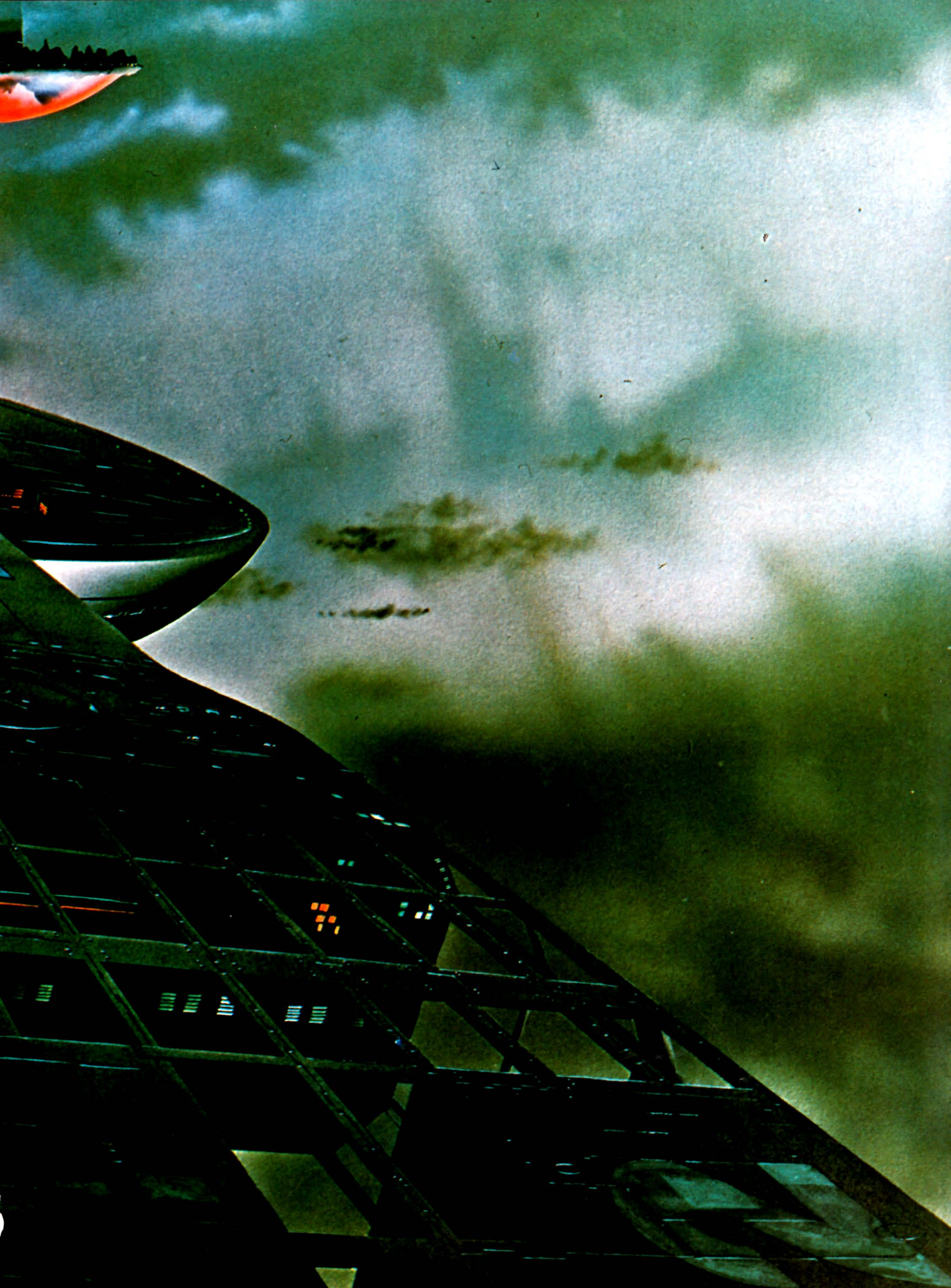
A variety of social groups clamoured for Federal support for their plans to push the frontiers further outwards, and the authorities were eventually persuaded to give many of the projects their blessing. In accordance with the procedure now established, the Federation's research agencies undertook to seek out and identify suitable subjects for colonization, and one such world was Nihalan.

This fairly young planet was very nearly rejected before any comprehensive survey had been conducted, due to its extremely hostile environment. Much of its surface was still forming and vast areas were the scene of constant volcanic activity as the molten core hurled itself to the surface. The overall temperature was uncomfortably high and enormous clouds of toxic gases moved over the scorching deserts that encompassed the globe. Life had nevertheless begun to evolve and in addition to simple plant forms, there existed a variety of reptilian species reminiscent of Terra's Mesozoic Era or the lizards of the inhabited world of Antico in the Delta Phoenicis system.

It was the diligence of one of the young researchers aboard the survey ship detailed to carry out the investigation, that resulted in the immediate classification of Nihalan as a prime settler world. Dr. Martin Harley, a recently qualified metallurgist and geologist, decided to take a small sample of the lava being ejected from deep within the planet for study during the long trip back to base. As he was not looking for any particular properties, he ran a complete constituent analysis which indicated the presence of a rare and remarkable material that had only recently been identified elsewhere.

The pure element zyrillium, had caused a sensation in scientific circles throughout the Federation shortly before Dr. Harley had graduated. Like iridium, it was believed to be a product of intense

A view of Nihalan and its nearby lunar companion, Phox, showing one of the areas of intense volcanic activity which are scattered over the planet.
Overleaf
A large zyrillium freighter approaches one of the distinctive enclosed cities which protect the inhabitants from the clouds of toxic gases which drift over the planet's surface.



stellar activity of the kind which constitutes a nova. Its most remarkable property was demonstrated when exposed to intense hyperwave activity. The breakdown of its loose molecular structure resulted in the release of prodigious amounts of energy as well as a considerable degree of temporal distortion. It had already been seized on by major engineering concerns as a possible hyperwave catalyst, and early experiments were proving more dramatic than had been imagined.

Shortly after Dr. Harley had returned with his findings, one of the industrial research agencies was able to demonstrate the immense potential of zyrillium as a hyperwave booster for a conventional warp-drive unit. The commercial possibilities excited tremendous interest throughout the Federation and the search for sources of supply became of interstellar importance. As a direct result, the Harley Report focussed attention on the otherwise disagreeable planet of Nihalan, and a settlement programme was immediately authorized.

The Pterodactyl-like Streech is a carnivorous creature found in the heat-scorched deserts of Nihalan. It is oviparous but possesses several distinctly mammalian characteristics.
Overleaf
Much of Nihalan's landscape consists of vast sheets of solidified lava inhabited only by various reptilian species such as this two metre long Snizzard. Most species are carnivorous and often resort to cannibalism for survival in the sparsely populated wastes.

Once the findings of the advanced survey teams were published, it was only the promise of a substantial share in the proceeds from the extraction of the uniquely large deposits of zyrillium, that persuaded a settler contingent to depart for Nihalan. They arrived in 2206 AD, one of the best equipped groups ever to set down on an alien world. Vast quantities of gear accompanied them, including two complete, prefabricated and entirely self-sufficient cities, which were set up in key, zyrillium-rich sectors.

It was some time before the colonists were established securely enough to begin the task of extracting the priceless ore, but by the time the first minute consignments were being shipped back, a large proportion of the Federation's military craft had already been modified to employ the extraordinary material in their warp-drive units.

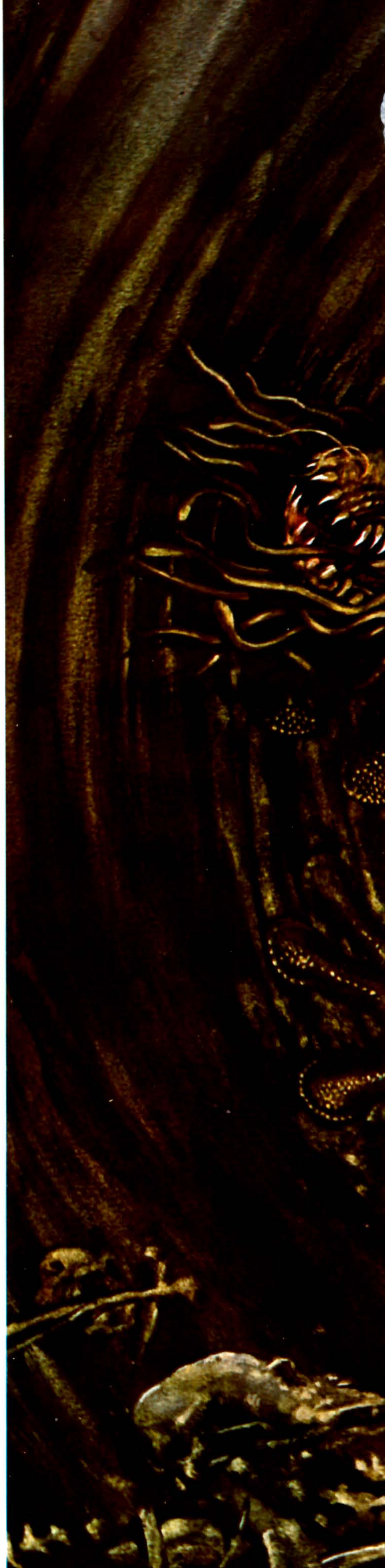
As the flow of processed ore increased, zyrillium began to become available for commercial application, under the watchful eye of the Federal authorities. The effect on interstellar trade and communication was dramatic. Not only were interworld travel times reduced by almost forty per cent, but direct communication systems also benefitted from the use of zyrillium in hyperwave signal transmitters, and contact between some worlds became almost instantaneous.

In an age of high technology, it is interesting to note that the most efficient method of searching out deposits employed by the zyrillium miners of Nihalan involves the use of Dypthylls, a subterranean species of reptile found on the twilight world of Nova Nevada at Beta Hydri. The sensitive feelers around this creature's mouth can, with training, detect the ore lodes with extraordinary accuracy.

Nihalan is the only planet in the Federation which is entirely under military jurisdiction, but a small quota of tourist passes are issued each year. Although interest is not encouraged and visitors are escorted at all times, it is fascinating to watch the miners and their Dypthylls at work in the labyrinthine tunnels that radiate out from the mushroom-like cities, and to be able to see a young and volatile planet in its formative stage.

Despite the sophisticated technology at their disposal, the zyrillium miners employ trained Dypthylls, a lizard imported from Nova Nevada, as the most efficient method of detecting the presence of the precious element. The illustration also shows the equine Tallox whose infra-red vision provides safe transport in the underground shafts.

Armed zyrillium freighter.



Esthymon

TYPE OF SUN: Beta Phoenicis Class G4. Magnitude 0.4.

POSITION: Southern hemisphere – Phoenix. Beacon code SPHE 795.

DISTANCE FROM EARTH: 180 light years.

TYPE OF PLANET: *Class A1. Escape velocity 8.1 M.P.S. Main exports: Tourism, leisure goods. Unrestricted access except to private property. Sovereign status awaiting ratification.*

The Beta Phoenicis system provides a base for the largest single industrial center in the Federation. Transport between the twenty-seven planets and countless asteroids orbiting the sun is assisted by the vast transit stations where passengers can embark for any destination in known space.

The yellow sun of Beta Phoenicis possesses one of the largest and most complex planetary systems in known space. Apart from three major asteroid belts containing some masses as large as Ceres in the Sol system, there are no less than twenty-seven planets, many of which also have moons. Most of the planets are extremely small and only one, Esthymon, possesses a hospitable environment, but the Beta Phoenicis system is an area rich in resources and is therefore of great interest to the worlds of the Galactic Federation. It was the second system to be investigated during the resurgence of interest in space exploration in the early part of the twenty-third century. A large settlement group consisting mainly of Alpha Centaurians and Terrans descended to the surface of Esthymon in 2223 AD, and quickly established a large base from which to explore the huge system around them.

The Beta Phoenicis system was clearly destined to become one of the major industrial centers of the Federation, as the broad spectrum of raw material sources lying in such close proximity to each other was an obvious advantage. Almost before the settlers had completed their first tentative exploration of Esthymon, the Federation's various large industrial interests were already beginning to ship in the materials and equipment needed to exploit the resources which existed in such abundance around them.

There were soon hundreds of processing and manufacturing plants springing up among the many planets and asteroids, and within six years of the first landing, Beta Phoenicis became one of the most important production centers in known space, supplying almost twenty-seven per cent of all finished goods made in the Federation. The population growth within the area as a whole was correspondingly dramatic, with creatures flooding in from every corner of the Federation to find work in the many flourishing industries. The planet of Esthymon became the central point in the hive of activity, and although its own resources amounted to little more than a temperate climate, wholesome atmosphere and undemanding gravitational field, these qualities were sufficient to guarantee the inhabitants a substantial income.

Esthymon, from the Alphan words meaning "gentle air", was the only place among the teeming planetary bodies of Beta Phoenicis where the workers from the hundreds of industrial sites could escape their artificial surroundings

The planet Esthymon retains a lush, natural environment.

A7
A7
THE YELLOW CAB COMPANY

and relax in the open air of a warm and verdant world. It soon acquired such a reputation for the variety and lavishness of its entertainments that its fame spread throughout the Federation, and visitors started arriving from beyond the orbiting factories.

There was something to suit everyone, from the flesh-pots and Sensotim parlours of the capital city, Corthwyn, to the pastoral delights of the uncultivated interior lands. Most of the inhabitants of the planet lived outside the cities for much of the time, returning occasionally from the small villages and estates where they lived to check that their lucrative enterprises in the urban complexes were operating efficiently. Although law and order on Esthymon are now maintained by the Federal Security Forces, in the planet's early days the citizens were obliged to protect their interests themselves; many recruited a militia to guard their property and even their lives against the rampages of creatures wildly celebrating a temporary escape from the isolation and toil of the new industrial bases.

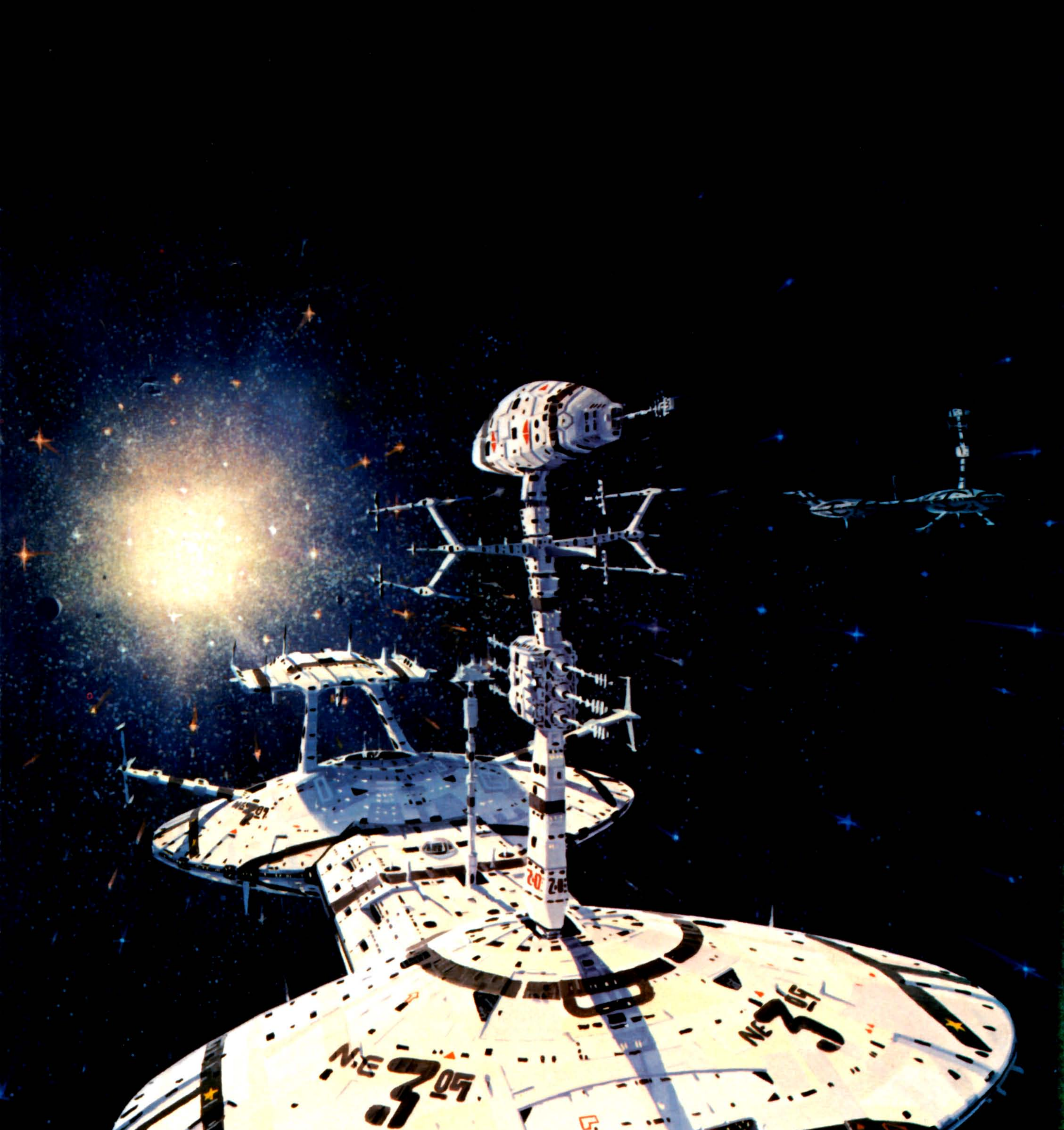
Many colourful and exotic characters emerged from the fast and furious years of the mid twenty-third century and were to be found on both sides of the law. Some, like Pethor Grosmann, an adventurer of Alphan and Terran extraction, lived by their own strict creed which did not always concur with Federation law. Grosmann was one of the first to see the possibilities in providing facilities for the pleasure starved workers, and founded a rudimentary but comprehensive range of entertainments. His immediate success allowed him to import, at colossal expense, more sophisticated ideas from nearer the Federal center, but these still failed to satisfy the tremendous demand.

By now many other Esthymonin were setting up in competition with Grosmann. His most determined rival was a Proximan trader called Smeeth Ohwaygn, whose methods of operation were even more dubious than Grosmann's. One day a consignment of equipment ordered by Grosmann, was being shipped in from Gadgetia at Gamma Doradus, when it was intercepted and removed from the freighter; it mysteriously reappeared some time later in one of Ohwaygn's arcades. Grosmann was unable to recover the gear as much of it was actually illegal, and Ohwaygn possessed seemingly authentic papers for the rest.

A short while later, Ohwaygn learned that a replacement order was on its way to Esthymon. As the freighter finally emerged from warp on the outskirts of the system and edged its way through the dense asteroid fields, it too was raided by pirates. A few days later, an unmarked ferry landed in the grounds of Ohwaygn's isolated and heavily protected country estate; Grosmann was sitting in his skimmer on the hills nearby with a small force of his employees. Just as the jets of the ferry whined to a standstill, he buzzed Ohwaygn on the vidfone. The latter answered immediately, gleefully anticipating Grosmann's frustrated rantings. As his face flickered on to the screen, Grosmann smiled gently and waved. A second later the grass all around his armoured skimmer vanished in an intense heat flash. This was followed by a thunderous roar as the entire valley below disappeared in the shadow of the radioactive mushroom cloud that climbed upwards from the vaporized site of the Ohwaygn estate. The vitrified surface where the building stood is still clearly visible today, although the valley has been deactivated by the Federal authorities for safety.

Such tales and legends abound and even the most unlikely seem credible in the larger-than-life atmosphere of the carnival cities. Dozens of extraordinary structures and extravagant follies stand as reminders of those flamboyant times, and many are occupied by the more law-abiding descendants of their builders. One which is particularly worth visiting is the complete primitive town built by Grosmann towards the end of his life, after he had retired with an immense fortune created by his many business activities. Obviously influenced by memories of his father's profession as a Terran historian, the town is a curious mixture of ancient styles drawn from Earth's

Passenger liners such as this Starfleet Major now ferry in pleasure seekers from all over the Federation to sample the delights of Esthymon.
Overleaf
For most visitors to the planet, the huge Pan-Am terminal on the outskirts of Corthwyn, the capital city of Esthymon, is the gateway to a world of new pleasures and unique entertainments.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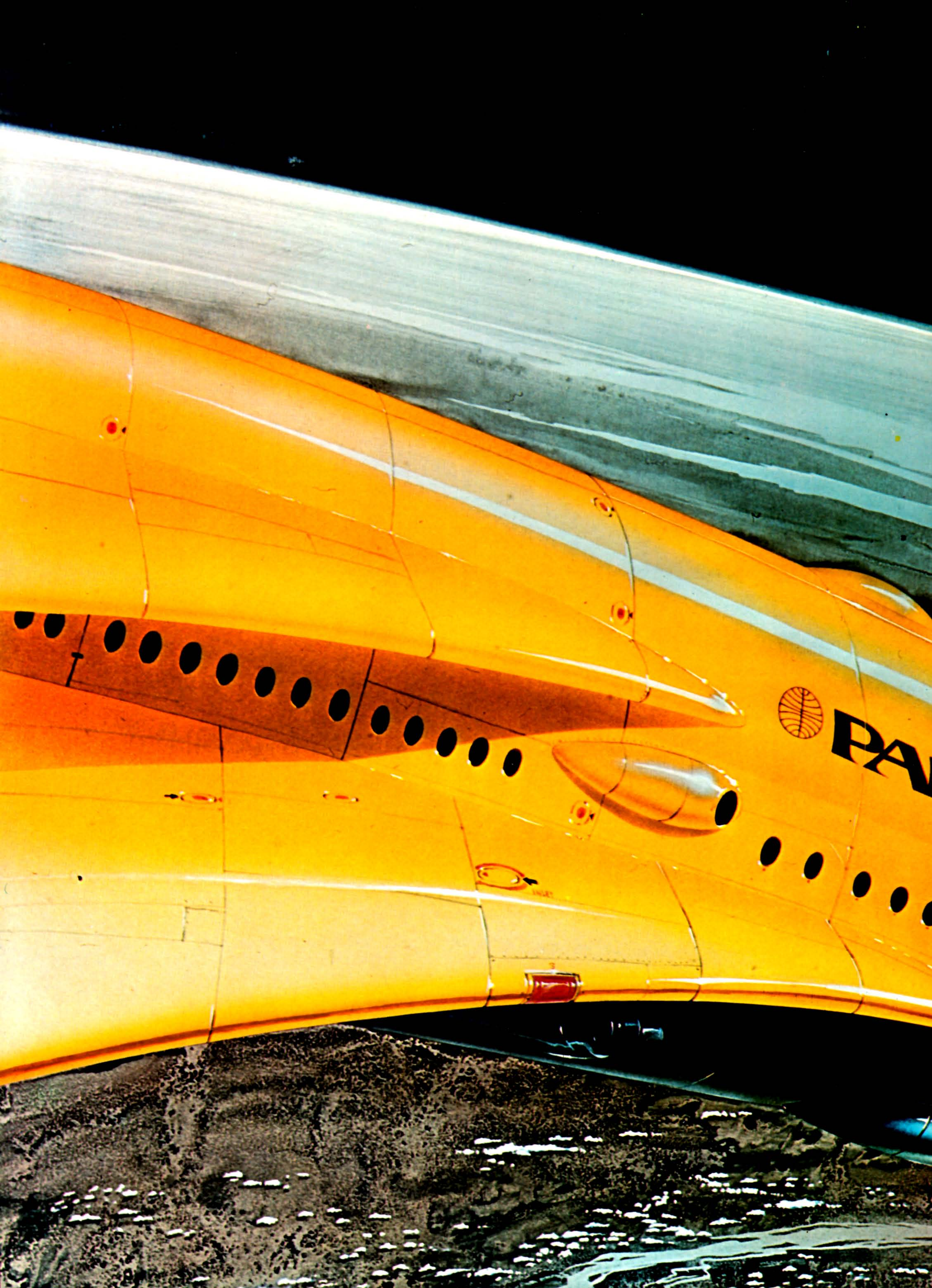
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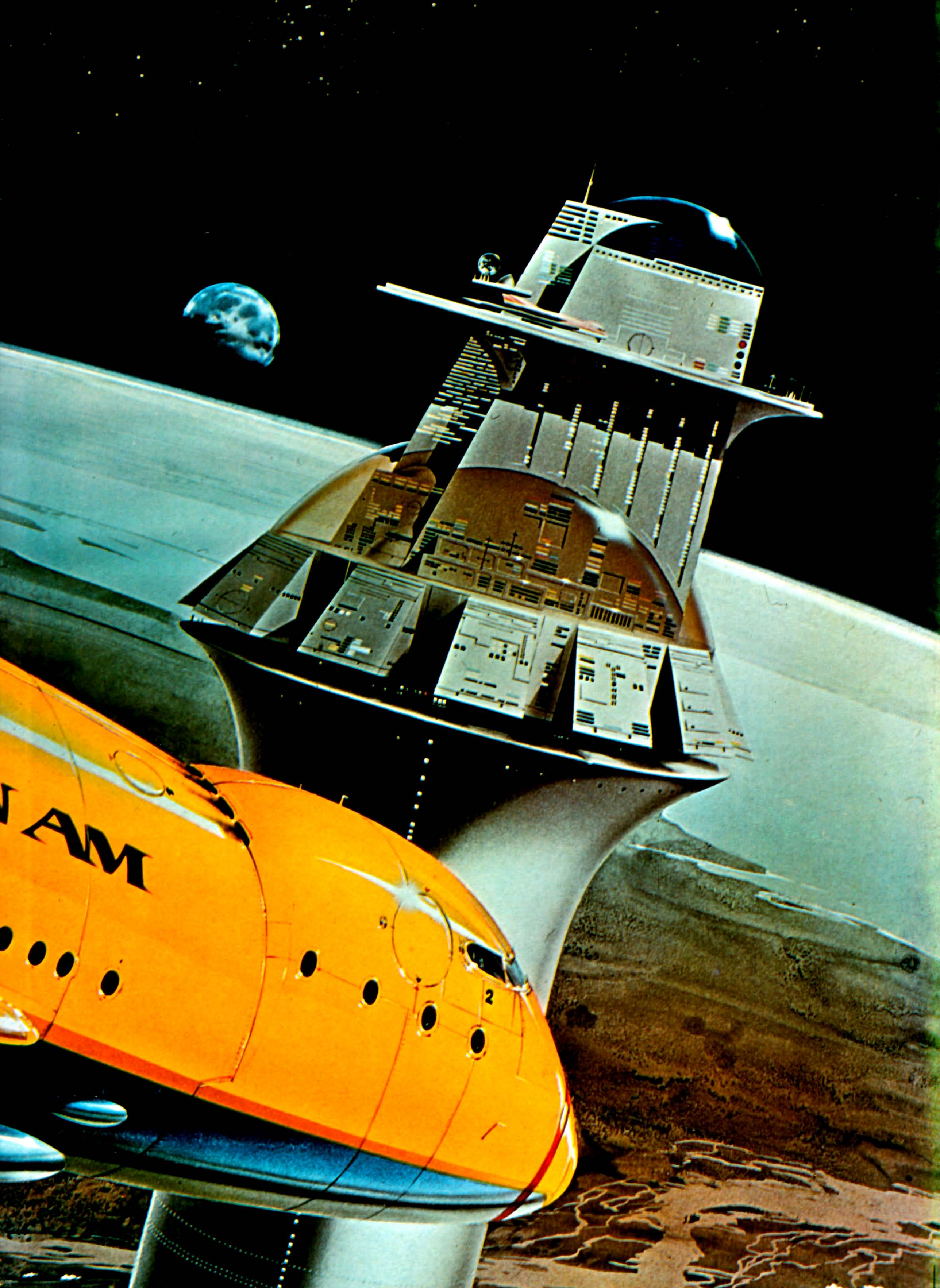
AM
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architectural history, and although highly suspect as a historical reconstruction, it is an intriguing and enchanting place to visit, and contains many delightful hostelries.

Probably the most popular way of seeing something of this fascinating planet is to travel from Corthwyn up the large river on which it stands on one of the great sail-barges. These craft were built as lavishly equipped novelties a long time ago, to provide unusual entertainment for rough and ready customers who could be deposited over the side if they became troublesome. Nowadays, their progress up the broad, slow-moving waters of the Pappalyx River is more stately; they stop overnight at the waterside settlements that once boasted the most notorious dives in the Federation.

Although a prolonged stay on the planet of Esthymon is likely to prove expensive, it is certainly worth visiting. Indeed, it is difficult to imagine, anywhere, a more delightful way of escaping from the routine of daily life.

The Beacon Tower Hotel, one of the most celebrated stopping places in the Federation, was once, before its closure by the Federal Security Force, a notorious club catering for the wildest whims of its clientele.
Overleaf
A delightful way of sight-seeing is provided by the sail-barges which still ply up and down the Pappalyx River. In the background can be seen the intriguing town built as a personal indulgence by Pethor Grosmann, one of the more colourful characters of Esthymon's wilder days.

15 Lyncis Bee

TYPE OF SUN: 15 Lyncis Class G6 giant. Magnitude 0.34.

POSITION: Southern hemisphere – Lynx. Beacon code SLYN 2153.

DISTANCE FROM EARTH: 230 light years.

TYPE OF PLANET: *Class D1. Escape velocity 7.1 M.P.S. Main exports: None. Small volume of zyrillium occasionally shipped. Landing subject to special licence.*

Contrary to popular belief, not all newly discovered planets prove to be sources of sudden wealth and romantic isolation. Indeed, only about one in every eighty or more proves to have prime commercial potential, and even fewer are able to support most forms of life without elaborate life-support systems. There are, however, many creatures living in the Federation who are unwilling to accept these facts, and embark on unofficial and highly illegal expeditions to the Federation Perimeter in search of empty worlds in order to make their fortunes.

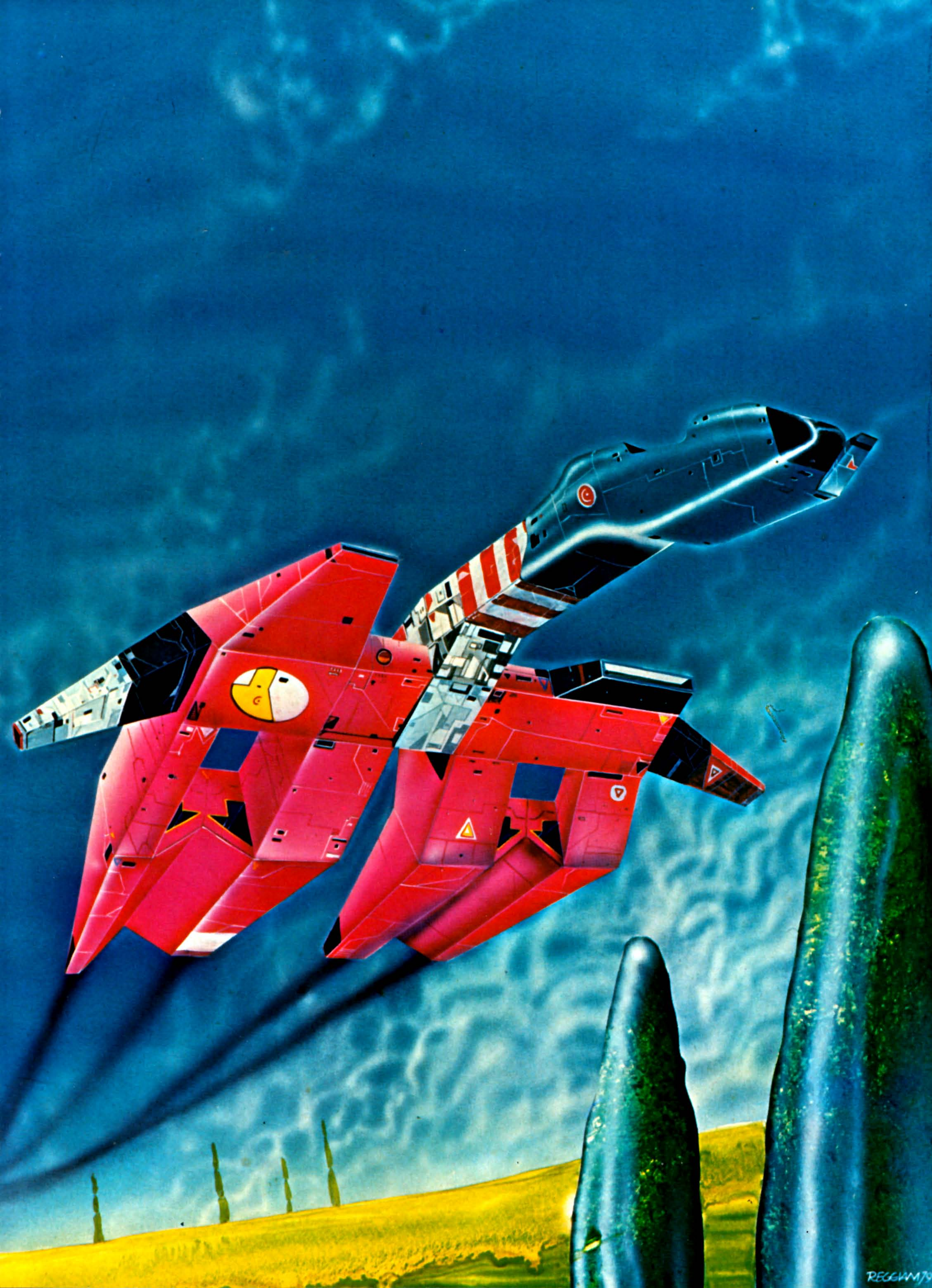
The Security Forces operating in the frontier regions are constantly required to rescue parties of adventurers with more courage than intelligence who have run into difficulties in these remote areas. They are not always successful in such cases as the distances between outposts are enormous, and the subjects of their mercy missions have often sealed their own fate by their secretiveness. The same problems face Security Force detachments assigned to protect inhabited worlds not yet actively involved with the Federation.

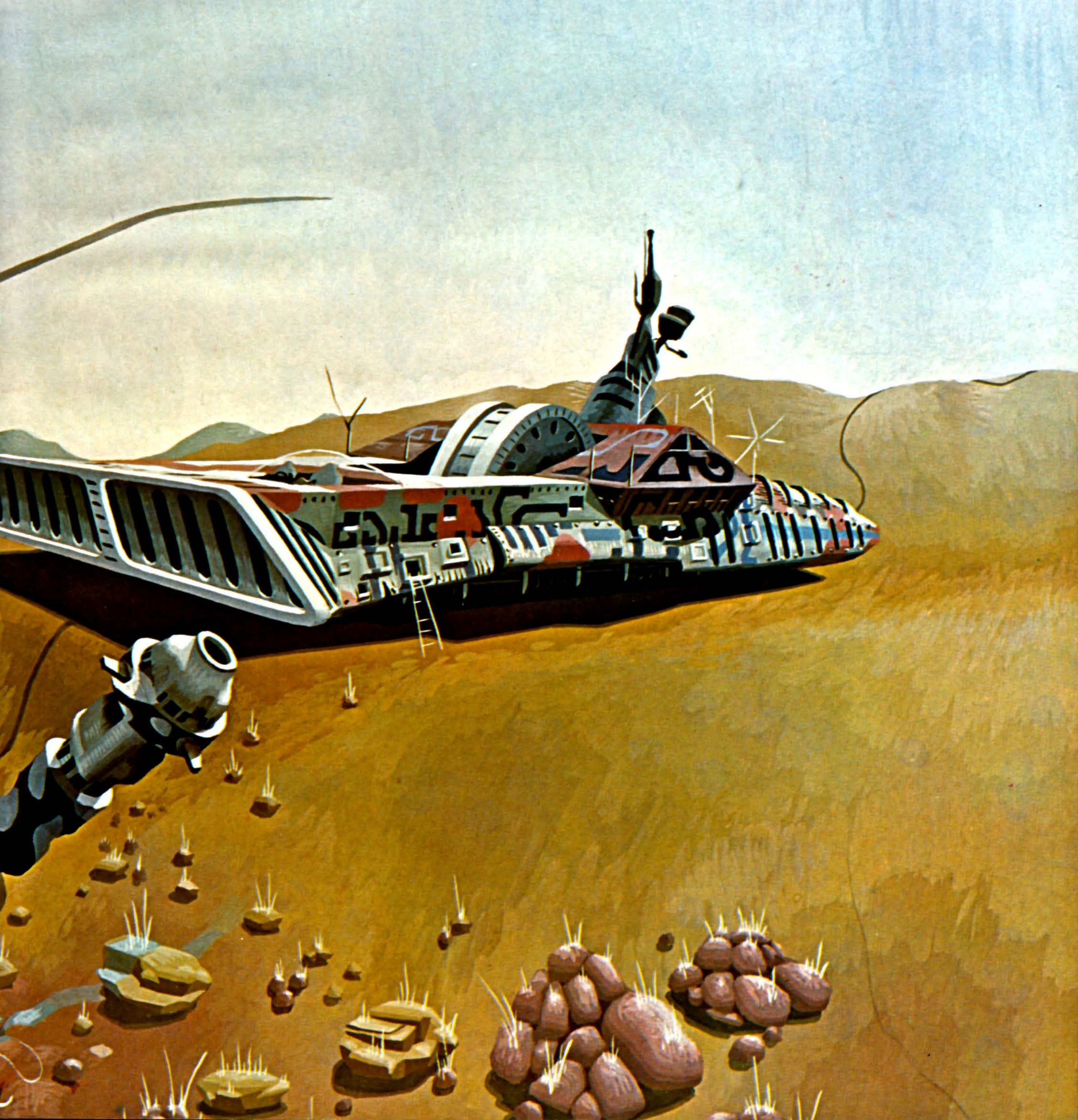
The only inhabitable world in the two planet system of 15 Lyncis is 230 light years out from Earth. It is registered as a settler world, but the only beings authorized to live there are part of a scientific community sent to study the intelligent life-form which has evolved, and to encourage progress towards full membership in the Federation. It is unfortunate that traces of the almost priceless element, zyrillium, have been found, and that somehow the information has leaked out. As a result, a steady stream of fortune hunters make their way towards the planet in the hope of making a quick strike and vanishing undetected back to civilization. The Federal patrols, already thinly stretched, do their best to intercept the unlicenced prospectors, but a small proportion always manage to elude them. Not all of the zyrillium runners who escape the net succeed in returning home, as space itself takes its toll of the often entirely unsuitable and ill-equipped vessels.

15 Lyncis Bee itself is very large and its land masses are dominated by gently rolling plains and hilly ranges, with thousands of unexpected rifts and crevices which are often several thousands of kilometers deep. The zyrillium traces reported by the scientific team were in fact discovered in one of these impressive trenches, and their open sections mean that should a deposit lie in a crevice wall, it is regrettably easy to extract; the crack itself provides very effective cover for a miner. An added problem is that the native inhabitants have sensed that the scientists, whom they regard with respect and a certain amount of awe, consider the element of great significance, and have therefore taken to collecting it as a magical substance.

It did not take the zyrillium-runners long to find this out and to realize that it was considerably easier to steal zyrillium from the natives than to find and dig it themselves. Some of the inhabitants were killed by the intruders, and patrols were intensified both on the planet's surface and in local space. The interception rate improved considerably but one or two runners were still getting through, and attempts were made to encourage the natives to simply hand their ore over to the few renegades likely to make

Until quite recently, the dolmens of 15 Lyncis Bee marked the sites of zyrillium treasure troves. Overleaf
The naive inhabitants of the planet often died at the hands of the zyrillium-runners for whom speed meant the difference between immense wealth and inevitable capture.





contact. The natives refused to cooperate as they took the fact that creatures were prepared to kill them for the metal as proof of its mystical potency, and it became the focus of a new almost religious cult.

To the horror of both the scientific community based on the planet, and the Federal patrols, the natives began to bury their collections of zyrillium in various sites which they marked with smooth stone dolmens or pillars. Sometimes the accumulated caches of ore were large enough to represent a substantial fortune on the black market, and would attract even more unwelcome attention. The only consolation was that the distinctive columns allowed the patrols to concentrate their forces in specific areas, but as more and more dolmens sprang up around the planet they began to find themselves undermanned.

Eventually there was no alternative but to place 15 Lyncis Bee under military jurisdiction and establish bases in the small asteroid cluster near the planet and on the surface itself. Within a

Typical Dolmen markings.

Although the threat to the inhabitants of 15 Lyncis Bee has diminished enough for military jurisdiction to be lifted, the Security Force still maintains a vigilant watch among the asteroids.

year criminal intrusion had petered out altogether, and the teams from the small research settlement concentrated on the task of accelerating the education programme in order to facilitate the emergence of the planet as a Sovereign World.

There was little doubt that the problems of 15 Lyncis were far from over. The zyrillium deposits were very small and widely distributed, and although there was enough to provide a small basic revenue for the future, the inhabitants would certainly not be able to rely on it in the same way as the people of Nihalan. In view of the general lack of any particularly useful natural resources, it is fortunate that the inhabitants are beginning to show an innate ability to grasp the concepts of modern science and technology. This is allied to an intense curiosity and it is quite possible that their most important export will eventually be their own expertise.

The planet was recently reclassified as an independent settler world when the inhabitants were finally persuaded to export the accumulated deposits of zyrillium, and the military bases were taken over by the Federal Security Force. Access is still strictly controlled and the planet is not yet open to the general public. Patrols pay close attention to any foreign vessel spotted in the vicinity.

Eptell III

TYPE OF SUN: Epsilon Telescopii Class G5. Magnitude 0.2.

POSITION: Southern hemisphere – Telescopium. Beacon code STEL 1773.

DISTANCE FROM EARTH: 300 light years.

TYPE OF PLANET: *Class E3. Escape velocity 8.4 M.P.S. Main exports: None. Research settlement. Access unrestricted subject to notification of intention and position.*

The planets of the Epsilon Telescopii system are undoubtedly rich in the more common raw materials, but demand is not sufficient for the planet of Eptel III to be considered a prime settlement site.

In the years following 2250 AD, planetary settlement once again slowed down and has been proceeding at the same rate ever since. Every Earth-year, approximately seven or eight new worlds are discovered and investigated, but seldom prove to be of sufficient interest to warrant detailed study of the kind required in a pre-settlement survey. The demand for raw materials and the available sources of supply have been fairly well balanced for some time, and few commercial enterprises have been willing to make the prodigious investment involved in exploration and settlement. They are quite content to let the Federation's survey and research teams carry out their own mapping programmes as any suitable sites are usually open to tender once they have been cleared for colonization.

The only planet to be settled in the immediate past has been Eptel III, 300 light years from the Federal center. The base there is still very small, and contains only a few civilian personnel. It is an inconsiderable, gloomy world in a nine planet system and although it contains a large pool of useful materials, none are of sufficient rarity to excite special interest. A certain number of test operations have been initiated and a little ore is shipped back to the big processing plants further in the Federation, but even this export is mainly to fill up spare capacity in the returning supply vessels.

The low light levels on the planet are due to its distance from the sun and to a thin cloud of interstellar gas and dust particles that lies inside the orbital path. The warm temperature of this twilight world is maintained by its considerable internal heat. Much of its interior is still molten, but although the magma lies close to the crust, there is remarkably little volcanic activity. Due to the poor light, plant and animal life is limited, and most of the vegetation consists of mosses, lichens and a scrubby grass that is actually a crystalline growth.

Eptel III is probably one of the loneliest outposts in the Federation, and its gloomy character makes it one of the less desirable postings for the crews of the Federation's study teams. The first team, led by Dr. Det Rechctelf, arrived for a two year duty tour to establish permanent bases and conduct the preliminary studies. The first eight months passed quite swiftly as they worked hard to set up their accommodation and laboratories, before setting out across the dim surface of the planet to collect data and map the planet. Five man teams would disappear into the gloom for periods of up to three months, returning to process their findings and rest for a few weeks before setting off once more.

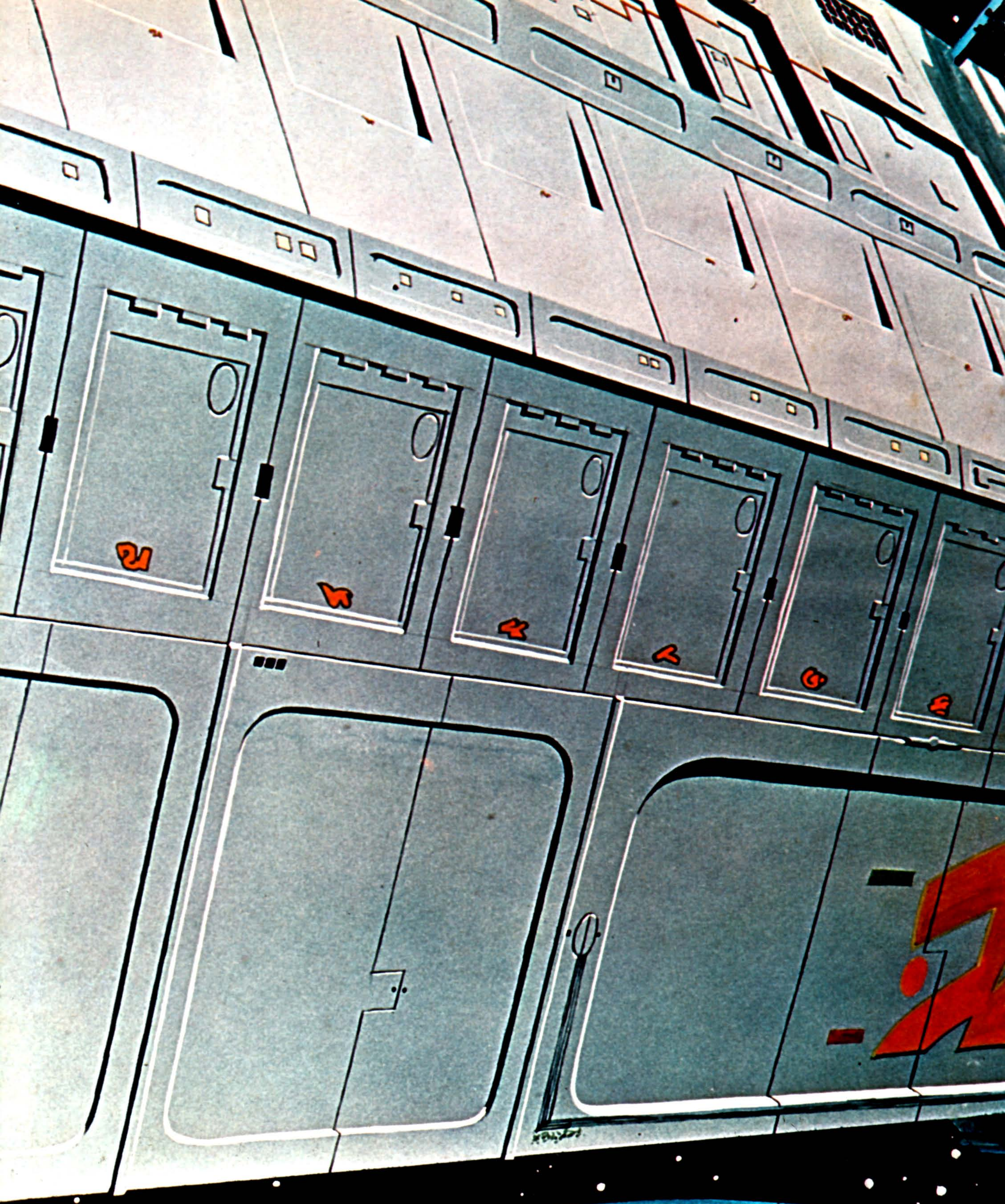
Soon after the beginning of the second year, one of the study groups failed to make their routine report and contact was lost. A search was carried out unsuccessfully and a few weeks later a second surface party also failed to report. Fortunately the second team had been working on a study of a particular river delta where large mineral and fossil deposits had been discovered, so they had been operating from a fixed base. A search party was able to find the site without difficulty, but once their transports had settled on the cleared landing site among the temporary buildings it was clear that something had gone very wrong. The bodies of two of the team lay outside the circle of light that shone from the windows of one of the huts, and another lay sprawled on the steps outside

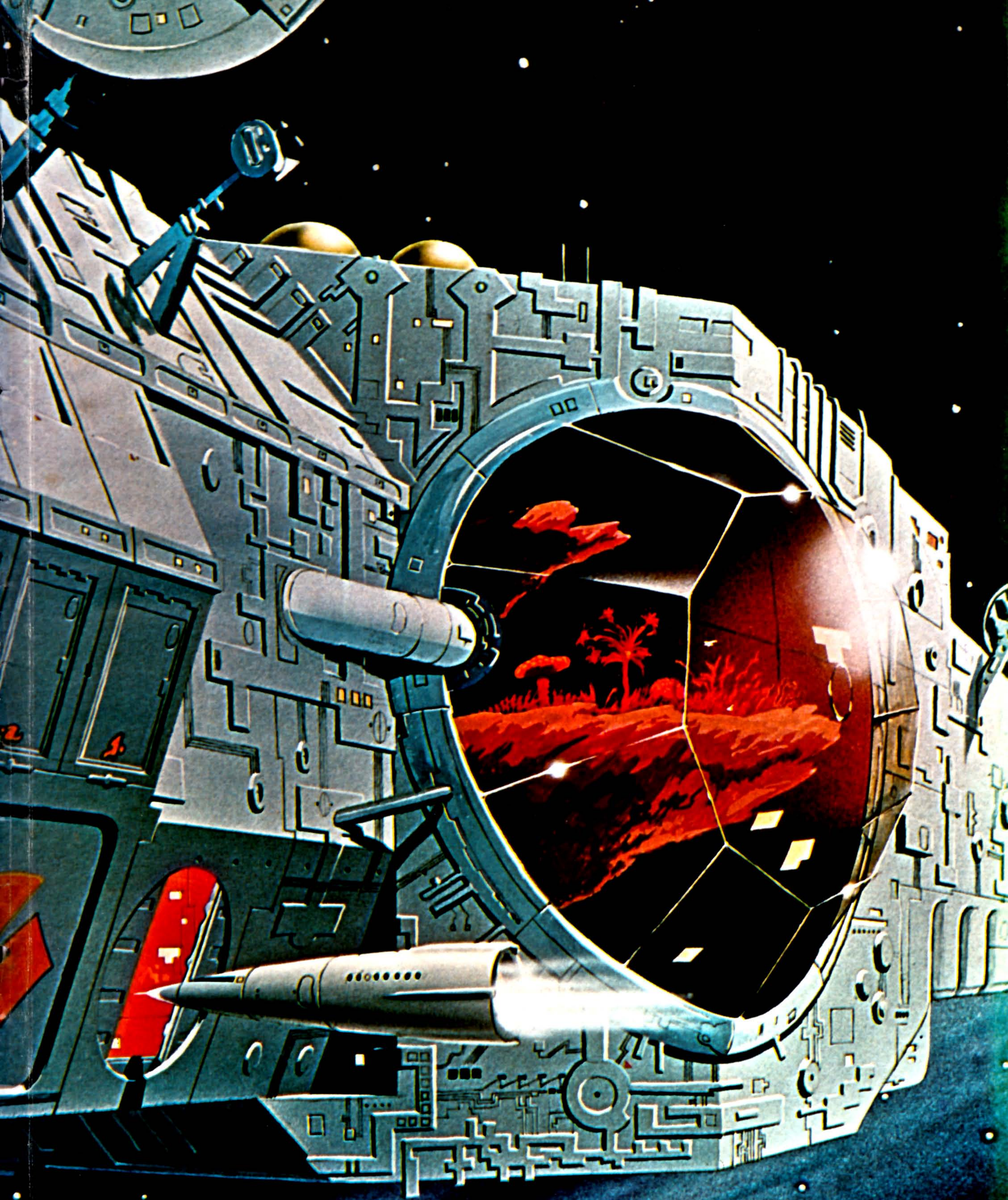
the door. The searchers cautiously approached the windows and peered inside. A grisly scene met their eyes; the walls and floor were stained with blood and dismembered portions of a fourth body were scattered around the single room of the shelter. When they entered the hut they found the last member of the team crouched in a corner, clutching a laser-cutter and entirely insane.

The fate of the other survey party eventually became known when two exhausted survivors stumbled into the main base. A similar tragedy had overtaken them when one of their colleagues became violently deranged. Returning from a trip by skimmer, he had landed and climbed out of the cabin, but on being greeted by his colleagues had looked at them in terror and scrambled back inside. Seconds later, the skimmer lifted off and swung in a wide arc before returning to plunge headlong into their midst. The two who escaped had been working in one of the cabins on the edge of the camp.

An Alpha Centaurian research ship delivers supplies to the base on Eptel III. These ships were often loaded with ore for the return journey in order to help finance the expensive settlement project.
Overleaf
The first settlement team based on Eptel III ended their two year tour of duty under the most macabre circumstances. Here the medical ship, Hermes IV, *approaches the planet in answer to the settlers' urgent cries for assistance.*

IV

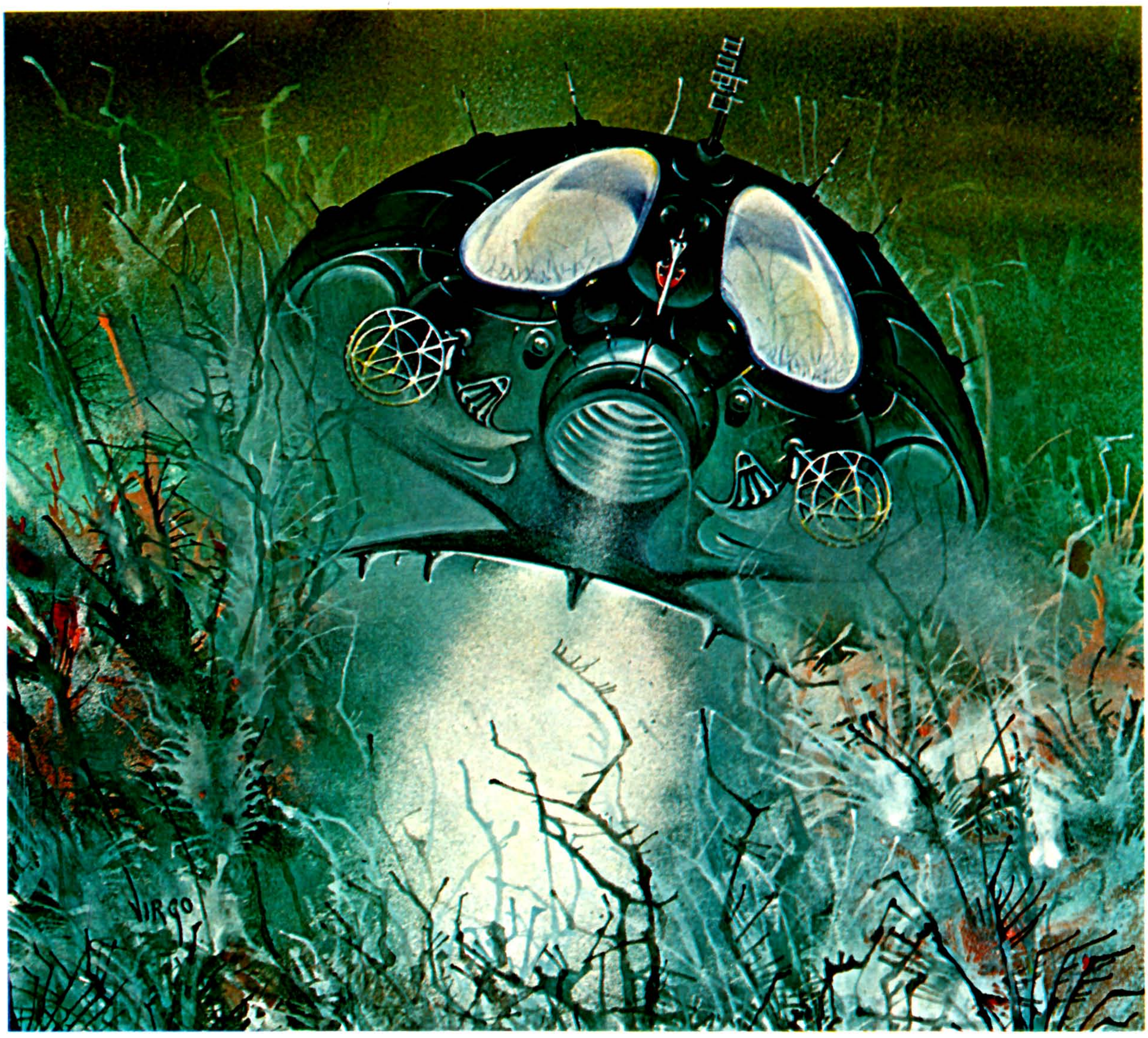




A medical team was requested, but before they arrived, several more individuals had suffered mental aberrations, and were undergoing treatment. The medics found that most of the personnel were experiencing a number of stress disorders and their report suggested that it was simply a reaction to the lonely and depressing nature of the environment. The simple remedy of reducing the tour duration to nine months proved to be enough to prevent a recurrence of the problem, but it has made operations on Eptel III prolonged and more expensive.

The Federation authorities did consider abandoning the project altogether, but the planet's huge potential as a source of common raw materials, while of little interest at present, will be of considerable importance in the future. Assuming that the Federation boundaries continue to expand into the galaxy, a point will eventually be reached where the cost of transporting materials from the present sources will become uneconomic and the twilight world of Eptel III will come into its own. In the meantime, there are no restrictions on civilian access, but it is unlikely that many tourists will make the long trip to this rather dreary system for some time to come.

The research team's surface skimmers proved invaluable in their surveys of the dim planet.



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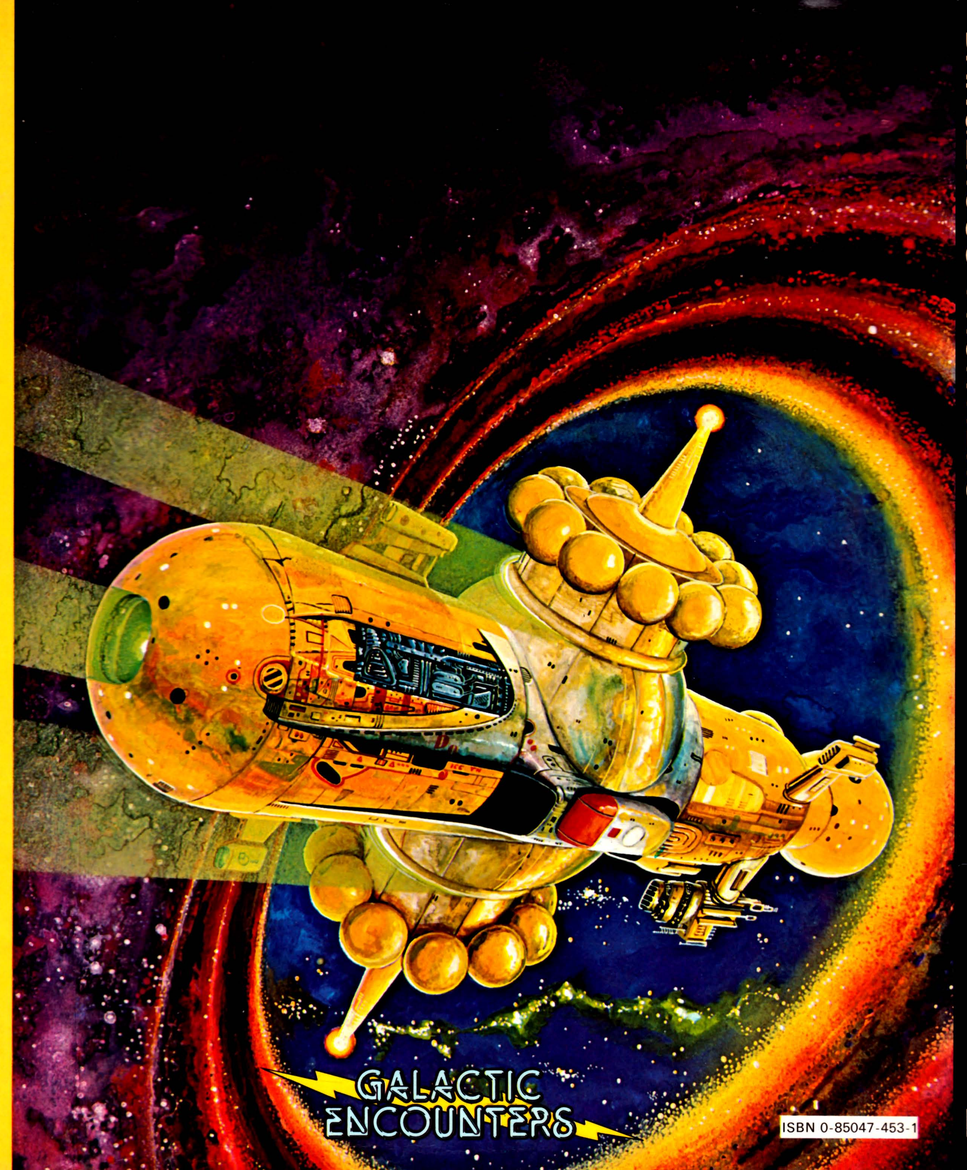

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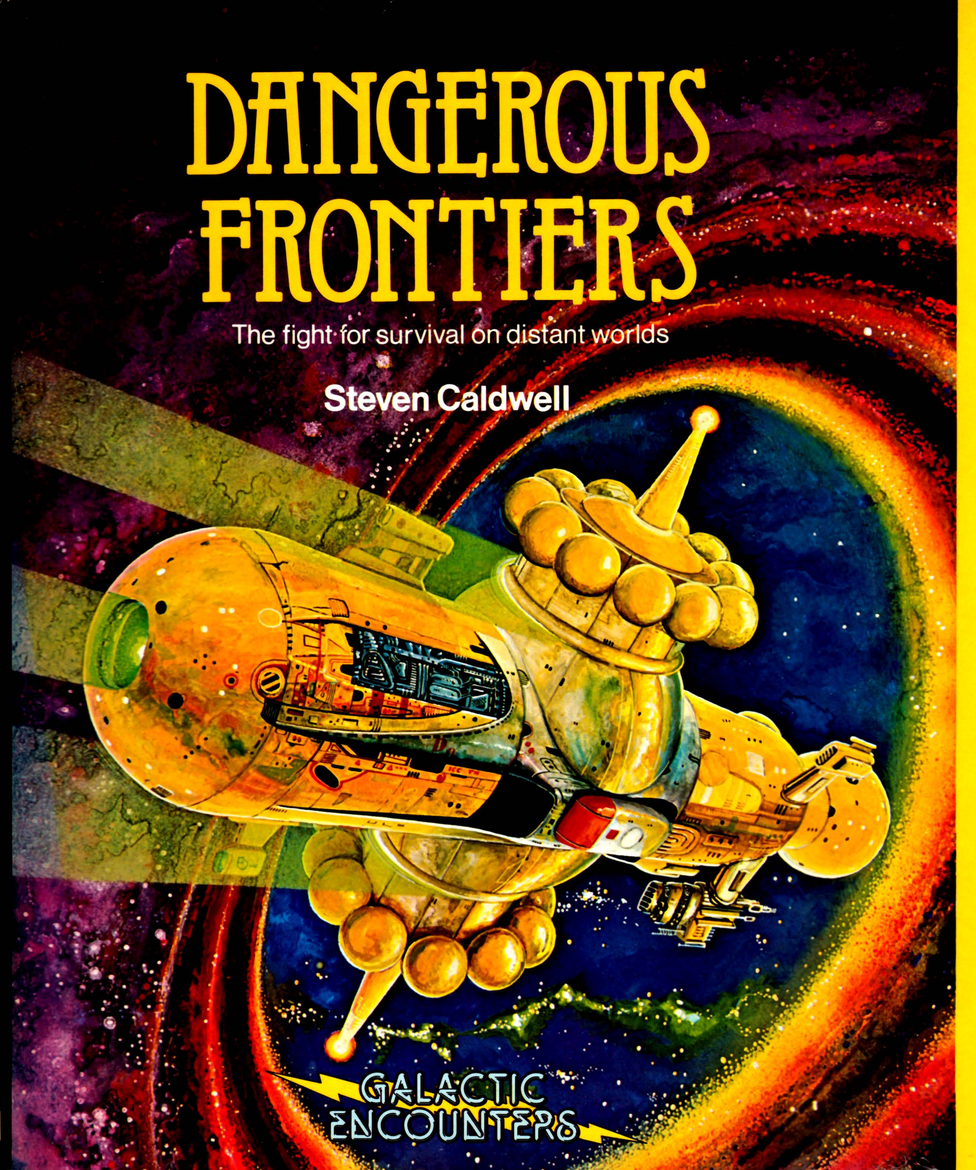

DANGEROUS FRONTIERS

The fight for survival on distant worlds

Steven Caldwell

The ships of the Galactic Federation's Survey and Preliminary Study Service ceaselessly range among the alien stars and unexplored planets which lie beyond the distant Perimeter. Contact with the bustling, central worlds of the Federation is difficult and infrequent as they face the dangers of the vast unknown.

But the prosperity and growth of this great association of worlds would be impossible without new sources of supply and new avenues for expansion. Scarcely more than one in every hundred planets explored proves to be of sufficient interest to justify the implementation of a settlement programme.

All the planets described in *Dangerous Frontiers* have won a place in the Federation at great cost in lives and effort, and their existence owes much to the courage and determination of the creatures who first struggled for a foothold in their lonely and alien landscapes.

Dangerous Frontiers is a study of those worlds as they are today. Some are vital to the network of trade, others have faded in importance and a few are only just emerging from obscurity. Whatever their present status in the Federation, it is to those who struggled alone in the emptiness beyond the frontiers that the honour belongs.

Steven Caldwell joined the Galactic Federation Security Force in 2393, and quickly rose to the rank of Group 1 Battleforce Commander. During his 15 years of active service he travelled to all parts of the Federation, and was awarded the Andromeda Star for his part in the settlement of the Perimeter Worlds.

He now runs his own company prospecting for the ore *zyrillium* – the major propulsive fuel for Interstellar Military Interceptors.

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